



Alberta's Peatlands and Non-settled Area Wetlands:

A Background Report



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Chapter 1: Introduction

Wetlands are an important part of Alberta's landscape, covering over 20 percent of the province's land base. Wetlands occupy approximately 13.7 million hectares or 137 000 square kilometres (33.8 million acres or almost 53 000 square miles). If all of Alberta's wetlands were located adjacent to each other, they would cover an area extending west from the border with Saskatchewan to Highway 2 and north from the border with Montana to just south of Edmonton. Only in Manitoba and Ontario do wetlands occupy a greater proportion of the provincial landscape.

The Alberta government is developing a policy concerning wetland management in the province. This process started in 1990, when policy recommendations concerning wetlands in the Settled Area (Figure 1) were published. These recommendations formed the basis for public consultations that focused on slough/marsh wetlands in the Settled Area. Following the public consultation process, management objectives for slough/marsh wetlands were developed, and wetland management strategies were drafted. This portion of the policy, titled *Wetland Management in the Settled Area of Alberta: An Interim Policy* was released in 1993.

During the Settled Area policy development and public consultation processes, the public and resource managers identified the need to complete the wetland policy for the entire province. The Alberta Water Resources Commission is currently coordinating development of the wetland policy for those wetlands not addressed in the Settled Area policy, specifically peatlands located throughout the province, and slough/marsh wetlands in the Non-settled Area. An interdepartmental steering committee, with members from Agriculture, Food and Rural Development; Environmental Protection; Municipal Affairs; and Transportation and Utilities has guided the preparation of this background report, and development of the policy recommendations. The public now has an opportunity to comment on these proposals. The public input will be incorporated into a revised comprehensive policy for all wetlands in the province which will be presented for government approval.

Approximately 75 percent of Alberta's wetlands are located in the Non-settled Area; they cover over 100 000 square kilometres, based on available statistics

(Alberta Water Resources Commission 1987). Several types of wetlands exist in the province. Slough/marsh wetlands occur throughout Alberta. They are the most common type found in the southern part of the province, and the type most often associated with the word wetlands. However, only about 7 percent of Alberta's wetlands consist of sloughs and marshes. Bogs and fens are the dominant types of wetlands in Alberta, comprising almost 93 percent (12.7 million hectares) of Alberta's wetlands (National Wetlands Working Group 1988: 5). Together, bogs and fens are referred to as peatlands, commonly known as "muskeg." In some locations, particularly close to the border with the Northwest Territories, peatlands occupy 75 percent to 100 percent of the terrain (Figure 2). Peatlands are also found in some areas in the Settled Area of the province, usually in the area near the boundary between the Settled and Non-settled areas.

Provincial peatlands (bogs and fens) and slough/marsh wetlands located in the Non-settled Area of Alberta provide numerous benefits to Albertans, including wildlife and fish habitat values, control over surface water flow and water quality, groundwater interaction, regional and global climate effects, and numerous ecosystem maintenance benefits. Wetlands in the Non-settled Area of Alberta contain large volumes of water and peat, and in some areas, support extensive timber resources. The potential exists for major developments for the extraction of peat for horticultural or fuel uses, or for the drainage of wetlands to increase timber yield. Activities such as road construction, oil and gas exploration and development, or tourism developments may have significant impacts on wetlands.

The conflicts between different values associated with development or preservation of wetlands are becoming more apparent. The Government of Alberta recognized that a wetland policy for the province that addressed peatlands throughout the province, as well as slough/marsh wetlands in the Non-settled Area is necessary to guide resource managers making decisions with direct or indirect impacts on wetlands. Alberta is not faced with the dilemma of European countries such as the Netherlands or Germany, where all or most of the peatland resources have been destroyed, and where expensive attempts to recreate the peatland resources

have had limited success. Development now of a comprehensive wetland policy for Alberta, including the proposals in this report for peatlands and Non-settled Area slough/marsh wetlands, will allow the government to consider wetland uses and values before the demands or impacts on the resource escalate.

The purpose of this report is to provide a summary of information about peatlands in the province, and slough/marsh wetlands in the Non-settled Area. It includes information about wetland types, classification and distribution (Chapter 2), functions and values (Chapter 3), and the principles governing wetland management (Chapter 4). Chapter 5 outlines the types of management tools available and the legislation, policies and programs which affect wetland management in Alberta are presented in Chapter 6. The report also presents policy recommendations concerning wetland management (Chapter 7) intended to promote discussion. Chapter 8 describes the opportunities for public comment on the policy recommendations. This report provides the detailed background information that was used to develop the draft policy recommendations included in the document *Beyond Prairie Potholes: A Draft Policy for Managing Alberta's Peatlands and Non-settled Area Wetlands*.

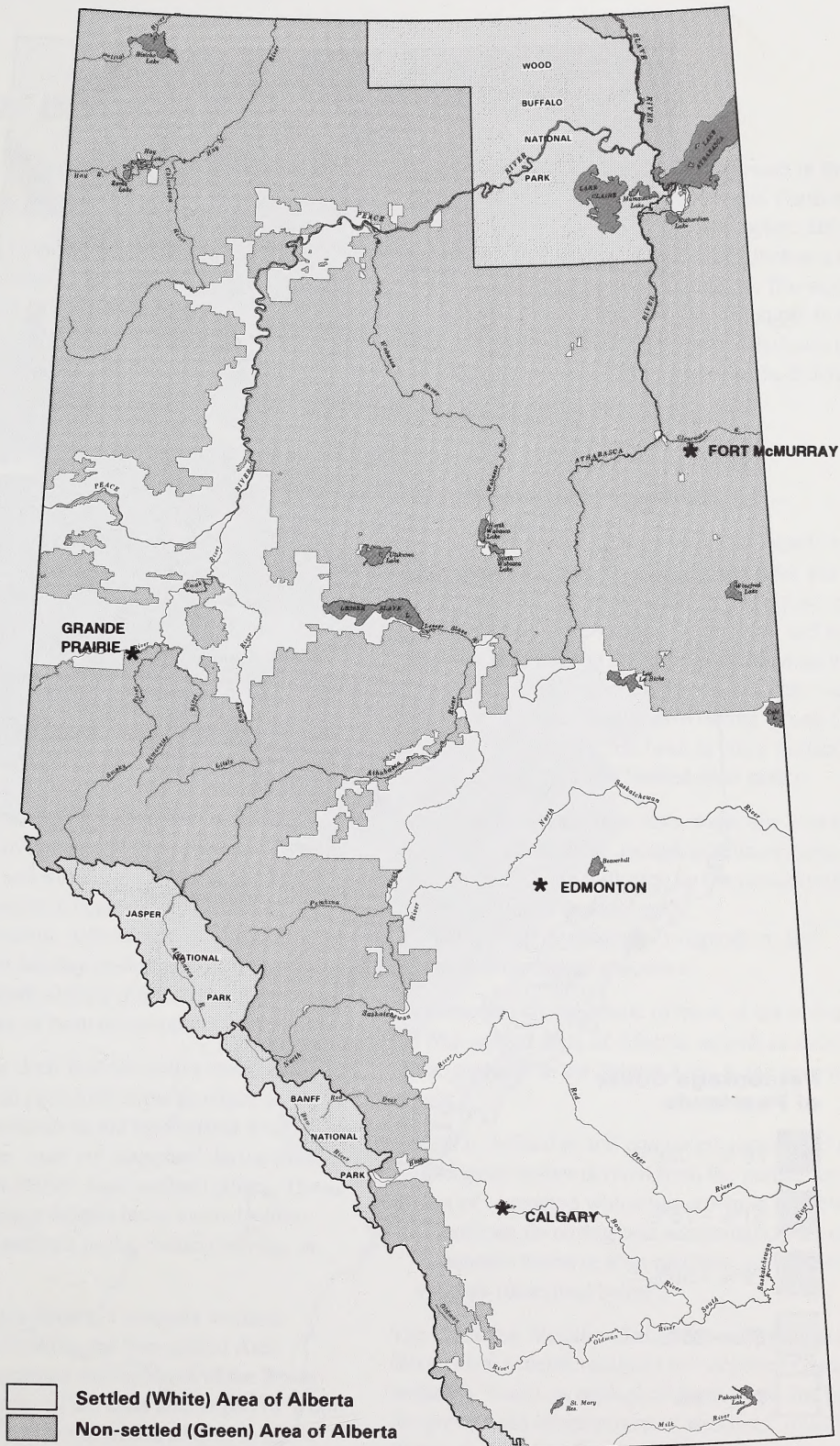


Figure 1: The Settled and Non-settled Areas of Alberta
 (Source: Alberta Forestry, Lands and Wildlife)

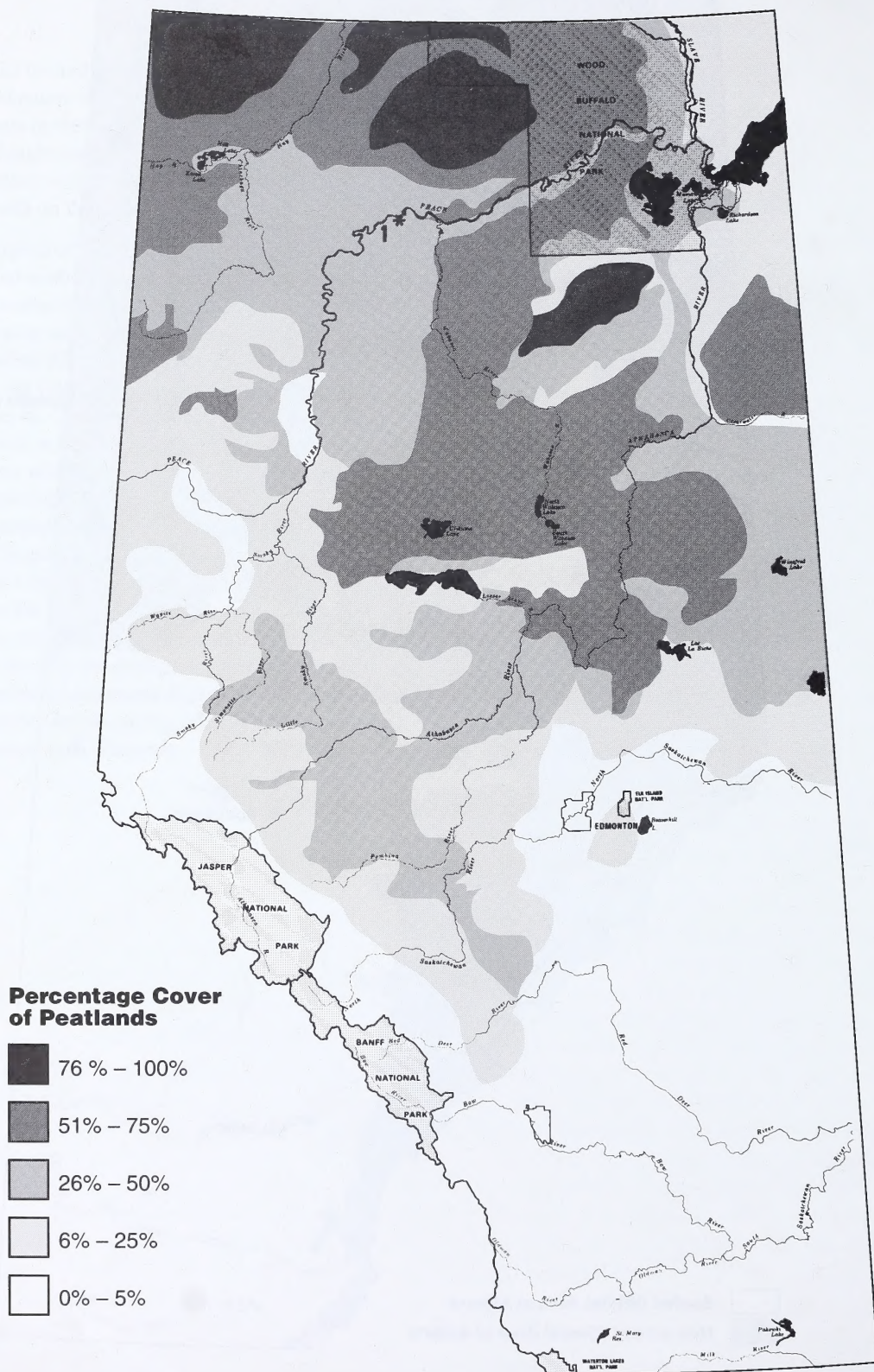


Figure 2: Peatland Distribution in Alberta (Source: Turchenek and Pigot)

Chapter 2: Background

Project Study Area: Non-settled versus Settled Area

Certain provincial lands were reserved by Order-in-Council in 1948 primarily for commercial and industrial uses (such as forestry and mining), and other uses deemed to be in the public interest. These lands included most of the forested area of the province, and lands with soils not considered to be arable. The government's intent was to prevent settlement in these areas (except where related to resource extraction) to ensure the government did not have to provide infrastructure such as roads or schools throughout the province. The lands withdrawn from settlement have been referred to as the "Non-settled" or "Green" area of the province; those available for settlement are called the "Settled" or "White" area of the province (Figure 1).

The Non-settled Area forms 53 percent of the province. Most of the land base is public land. Public land is managed for multiple uses including forest production, recreation, and watershed protection, and is not available for agricultural development other than grazing. Responsibility for managing public land is shared between Alberta Environmental Protection and Alberta Agriculture, Food and Rural Development. Alberta Environmental Protection controls land ownership, planning, and allocation. Alberta Agriculture, Food and Rural Development has day-to-day responsibility for managing public lands already allocated to agricultural uses such as grazing or farm development leases.

This report, and the draft wetland policy statements it contains, concern all peatlands in the province as well as slough/marsh wetlands in the Non-settled Area of Alberta. These areas were not addressed during the development of the Settled Area wetland policy. The policy will not apply to federal lands located within Alberta, including national parks, Indian reserves, or military bases.

The Peace-Athabasca delta is a complex wetland ecosystem partly located in the Non-settled Area. Several factors complicate management of the Peace-Athabasca delta. Some of the delta area is part of Wood Buffalo National Park. Some area is subject to native land claims. Interprovincial activities, specifically the

operation of a hydroelectric dam upstream in British Columbia, may also affect the wetlands. Furthermore, the hydrology of the ecosystem is complex, affected by the hydrology of both the Peace and Athabasca rivers, including the timing of spring breakup. The wetland policy developed for the province will apply to the delta, but management of the Peace-Athabasca delta will require other initiatives involving the federal and British Columbia governments as well.

Wetland Definitions and Classification System

Wetland is a commonly used term that loosely refers to areas that are too wet to be considered land, but not wet enough to be a lake. Many wetland definitions exist, but most consider three elements: water, soil, and vegetation, with emphasis on the effects of abundant water on the soil and vegetation components. For this wetland policy, the National Wetlands Working Group (1988) definition is used, as it has been in other wetland policy in Canada, including the Settled Area policy.

A wetland is defined as an area where the land is saturated by water long enough to promote aquatic processes which are indicated by the presence of:

- poorly-drained (hydric) soils;
- water-loving (hydrophytic) vegetation; and
- wet area biological processes.

An important characteristic of most of the wetlands in the Non-settled Area of Alberta, as well as almost half of the wetlands in the Settled Area, is the accumulation of peat.

Peat is defined as soil composed almost exclusively of organic matter derived from the partial decomposition of vegetation which has grown in shallow water. Conditions favouring peat accumulation are most commonly found in bogs and fens, and sometimes swamps (described below).

The Canadian Wetland Classification System is a hierarchical scheme designed to categorize Canadian wetlands "based on ecological parameters that influence the growth and development of wetlands" (National Wetlands Working Group 1987:13). These parameters include biological factors such as vegetation, wildlife,

and peat, as well as non-biological factors such as hydrology, climate, soil, and basin shape.

Wetlands are arranged under this system into five main classes:

- bogs
- fens
- swamps
- marshes
- shallow waters less than 2 metres deep.

Wetland classes can be further subdivided by landform type and vegetation, to provide a more detailed description of individual wetlands if required.

Peatlands, which include both bogs and fens, are the most common types of wetlands in the Non-settled Area of Alberta. Peatlands are characterized by the accumulation of peat, and relatively stable water tables. Open water may or may not be visible. A **bog** receives most of its water from rainfall. The water in a bog is very acidic, often with a pH less than 4. Vegetation consists primarily of Sphagnum mosses and some trees able to tolerate the acidic water and low nutrient levels. The groundwater table is located at or near the ground surface. A **fen** receives most of its water supply from the groundwater; therefore the water contains more nutrients and is less acidic than in bogs, with the pH ranging from 4 to 8. The groundwater table is located at or above the ground surface. Vegetation can include sedges, grasses, shrubs, or trees.

To a casual observer, a bog may look like a forested area with a poor growth of black spruce or tamarack trees. Some fens may look like open fields of sedges or grasses or may have a dense cover of black spruce and tamarack trees. However, closer examination may reveal that the area is extremely wet, the soil is composed of organic material and plants tolerant to wet, acidic conditions are present.

The term *muskeg* has been used in North America to describe wetland areas covered with mosses, including Sphagnum species, some sedges, and discontinuous tree cover. Because of its loose meaning, it is not commonly used today in the scientific literature, and will not be used in this report.

Peatlands are defined as peat covered terrain (National Wetlands Working Group 1987: 438). Generally the term is applied in Canada to wetlands where the thickness of accumulated peat exceeds 40 centimetres. Conditions favouring peat accumulation are most commonly found in bogs and fens, although small peat accumulations may sometimes occur in swamps. Thus the term peatlands generally refers to bogs and fens. Many peatlands in Alberta are underlain by permafrost.

The image most closely associated by Albertans with the term wetlands is that of a *marsh*, or slough/marsh wetland, a depression filled with open water and emergent vegetation that is commonly inhabited by waterfowl. Slough/marsh wetlands do not occupy as much area as bogs and fens in the Non-settled Area of Alberta, but they play a critical role in waterfowl production in the province. Slough/marsh wetlands are areas that are periodically inundated by standing or slow-moving water, and the root zone is flooded for most of the growing season. *Shallow open water* is a category that encompasses the transition zone between lakes and marshes, describing areas of predominantly open water less than 2 metres deep. These wetlands, also known as ponds, are temporarily or permanently flooded during most of the growing season. *Swamps* are areas that are flooded at least seasonally by standing or slow-moving water. The vegetation consists of a dense cover of deciduous or coniferous trees and shrubs. Swamps are not common in Alberta. They are generally confined to the transition zone between peatlands and upland forests, where deciduous or coniferous trees may be affected by seasonal flooding or increases in the water table elevation.

Within these five main classes, many different wetland types exist, depending on the specific combination of climate, landform type, and vegetation factors. For example, the amount of precipitation or groundwater discharge in an area combined with the surface topography determines which areas will collect water. The climate affects the type of vegetation which grows, and the associated rate of evaporation, which in turn influences water saturation. Climate and water conditions affect the accumulation of peat. The accumulation of peat can change the elevation of the ground surface relative to the water table. Eventually this may change

the microclimate and the water chemistry in the root zone, resulting in a change in vegetation.

It must be remembered that the distinctions between different wetland classes are gradual, not abrupt, and that wetland complexes may consist of several types of wetlands within one area. This is particularly true in the Non-settled Area of Alberta. Most peatlands are complexes of bogs, fens, and occasional swamps. Often distinctions between wetland types, particularly bogs and fens, cannot be made by visual examination only. An understanding of the water system and chemistry is necessary to make the distinctions.

Peat: A Critical Component of Non-settled Area Wetlands

As discussed above, peat is a critical component of many wetlands in the study area. Conditions that permit peat accumulation persist over a wide range of the Non-settled Area, but generally only extend into the Settled Area in the regions north of the North Saskatchewan River. Peat accumulates when the rate of plant matter decomposition by microorganisms is slower than the rate at which the plant matter dies and accumulates. Organic material decomposes very slowly when the oxygen supply is limited, (such as when the plant matter remains saturated by water) and in cold temperatures. Peat will exhibit varying degrees of decomposition, depending on the water saturation, the amount of microbial activity, and age of the material. If conditions change and peat is exposed to more oxygen, such as when the water table fluctuates, decomposition rates may increase.

In the northern part of North America, peat accumulates at rates of approximately 0.3 millimetre to 0.7 millimetre per year (3 centimetres to 7 centimetres per century). The average depth of peat in the southern part of the Non-settled Area in Alberta ranges from 3 metres to 4 metres. Further north it is only 2 metres to 3 metres thick because the rate of vegetation growth is slower. In the montane areas of the eastern slopes, the peat is usually less than 1 metre thick. This compares to peat depths of up to 10 metres or more in Atlantic Canada, where the climate permits faster plant growth. Peat could be considered a non-renewable natural resource, given the length of time it takes to accumulate.

Peat may be composed of different types of plant material, including mosses, sedges, rushes, or grasses, depending on the vegetation growing in the wetland. One type of peat is composed of Sphagnum mosses, commonly referred to as peat moss.

Wetland Distribution in Alberta

In Alberta, wetlands cover approximately 13.7 million hectares, or approximately 20 percent of the land surface area (National Wetlands Working Group 1988). Although this estimate includes the wetlands located on federal land within Wood Buffalo National Park, it shows the extent of wetland resources on a provincial scale. Only in Manitoba and Ontario do wetlands comprise a greater percentage of the land base than in Alberta (41 percent and 33 percent respectively).

Peatlands, including bogs and fens, comprise almost 93 percent (12.7 million hectares) of Alberta's wetlands. Bogs and fens are the predominant wetland forms in the Non-settled Area. The remaining wetlands in the Non-settled Area consist of marshes and shallow open water, with some swamps.

The Drainage Potential in Alberta Study (Alberta Water Resources Commission 1987) estimated that bogs and fens covered approximately 2.2 million hectares within the Settled Area of the province. The area of bogs and fens is highest in the northern part of the province, in the Peace, Athabasca, Beaver River, and North Saskatchewan river basins. Some peatlands are present in the Red Deer River basin, but none occur in the Battle, Bow, South Saskatchewan, Oldman, or Milk river basins. Similar estimates of river basin area covered by slough/marsh wetlands in the Non-settled Area have not been calculated. However, in some parts of the province, particularly near the border with the Northwest Territory, wetlands cover 75 percent to 100 percent of the land area (Figure 2).

Recent estimates indicate that wetlands comprise 127 to 170 million hectares in Canada which is approximately 12 percent to 14 percent of Canada's surface area (National Wetlands Working Group 1988, Gorham 1990, State of Environment Report 1991). Approximately 87 percent of Canadian wetlands are classified as peatlands (National Wetlands Working Group 1988). Approximately 11 percent of Canada's wetlands are

located in Alberta. Only in Ontario (23 percent), the Northwest Territories (22 percent) and Manitoba (18 percent) have a greater proportion of the Canadian wetlands. Therefore, the wetland resource in Alberta is not only significant from a provincial perspective, it is an important component of the total Canadian wetland resource.

Information Sources about Wetlands

Information about wetlands in the study area can be found in soil survey maps, ecological or physical land classifications, and forest inventory maps (Turchenek 1990). Studies of environmentally significant areas (ESAs) include information about wetlands considered to be environmentally significant, in the context of the report. ESA reporting has not been conducted for the entire province, but one report about the eastern boreal forest covers approximately one quarter of the Non-settled Area at a scale of 1 to 500 000.

Two maps specifically plot Alberta's peatlands. Turchenek and Pigot (1988) mapped the percentage of area covered by peatlands, and divided the peatlands into ecoregions based on vegetation cover, at a scale of one to 2 million. Vitt (1992) mapped the areas covered by bogs, fens, and forested fens at a scale of 1 to 1 million. Information about specific aspects of wetlands, such as important wetland areas for waterfowl production, is available from sources such as Ducks Unlimited.

Wetland Research

Four areas of wetland research needs in Canada were identified in 1991 by scientists and wetland managers (Wedeles et al. 1992). They included research in the following areas:

1. the natural hydrogeochemical processes in wetlands, such as carbon and nutrient cycling, internal hydrological dynamics and links with external systems;
2. the effects of global climate change, atmospheric pollution, and land use activities on wetlands;
3. wetlands as wildlife habitat, wildlife responses to wetland change, wetland succession and restoration; and,

4. wetland management, including infrastructure and organizational requirements for wetland research (including inventory and monitoring).

These research areas reflect the need to understand basic functions and natural dynamics of wetlands before we can begin to understand interactions with other adjacent ecosystems, to predict impact of human-related changes such as climate warming or atmospheric pollution, or to understand the role of wetlands as wildlife habitat.

Wetland research is currently being conducted at several levels in Alberta. Theoretical and applied research on wetlands in general, and peatlands in particular, is being conducted at the University of Alberta. Wetland ecosystem studies addressing issues such as water management and sustainability of ecosystems are being conducted using resource accounting and integrated land planning frameworks as part of the Mackenzie Basin impact study. The study is looking at possible impacts of climate change in the Peace, Athabasca, Liard and Mackenzie river basins, part of which falls in northeastern Alberta. The Alberta Research Council, in conjunction with the provincial government, has conducted research into natural reclamation on harvested peat bogs. The horticultural peat industry, along with government and the university, is conducting research on peat bog restoration. Forestry Canada is continuing research initiated by the province on peatland drainage to improve timber yields.

Chapter 3: Wetland Functions and Values

Wetlands have been characterized in the past as wastelands, areas that provided obstacles to development, or were a nuisance to humans. Increasingly, we are learning that this is not the case. Wetlands perform many functions, such as controlling water quality or providing wildlife habitat. A function can be defined as something a wetland does, by virtue of its existence. Obviously, different wetlands will perform different functions, depending on the wetland type, location, size, and the surrounding conditions.

A function is perceived to have value when individuals or society can derive a benefit from that function. These benefits may be economic, social, or environmental. If society values a certain function, such as the provision of wildlife habitat in wetlands, it may cost tax dollars to replace that function if it were lost through development. Values, including those associated with wetlands, are more difficult to evaluate than wetland functions for several reasons. First, values may be different from one person to the next. Second, some wetland values are difficult to quantify. For example, the economic benefits of peat harvesting may be easier to calculate than the value of maintaining a bog as an educational site for future generations. Third, values change with time, location, changing technology, and needs. Although Alberta has extensive peatlands on a provincial scale, a specific example of a certain type of peatland may be the last example in a particular region, and so could be deemed to have more value.

We use wetlands and the resources they provide in many ways. Some of these uses, such as agriculture on peat soils or peat harvesting, involve converting or changing the wetlands. A component or function of the ecosystem, such as the soils or vegetation, or chemical cycles may be altered or destroyed by the activity. These are referred to as *conversion* uses. Other uses, called *conservation* uses, depend on the wetland functions being conserved or maintained. For example, if a wetland is to provide habitat for woodland caribou, it must continue to provide the food and shelter the animals need.

Functions performed by slough/marsh wetlands in the Non-settled Area and provincial peatlands are described first. The principal uses of Alberta's peatlands and Non-

settled Area wetlands are then described. The chapter concludes with a summary of other activities conducted in the Non-settled Area and on Settled Area peatlands that are not dependent on wetlands, but that may have an impact on wetlands in the area.

Wetland Functions

Water Resources Functions

Water is a critical component of the wetland ecosystem. By definition, wetlands are areas where the water table is located near, at, or above the land surface. The function of wetlands in the water cycle varies widely, depending on factors such as the wetland type, size, proportion of area covered in the watershed, the source of water in the wetlands (groundwater, surface runoff, or precipitation), the time of year, and preceding precipitation events. Insufficient research has been conducted to understand or predict the role of Alberta's wetlands including peatlands in the water cycle. For example, a wetland may control runoff from a storm, changing the volume and timing of flows into a river or stream. However, one theory states that for fens where the groundwater table is near the surface, rain moves directly into surface runoff, and is not stored in the wetlands at all (Boeye and Verheyen 1992).

Similarly, the impact of activities on wetland hydrology is difficult to predict and quantify. Some models are available to predict stream flow changes based on basin activities. However, the usefulness of these models is limited by the lack of inventory data. More information is required about the factors such as geology, topography, soil and wetland types, and runoff rates before models can be used with a high degree of confidence. Used carefully, the existing models may give an indication of possible effects of activities such as timber harvesting on wetland hydrology.

Biological Functions

Wetlands are diverse ecosystems with a range of biological productivity, genetic diversity, habitat types, and wildlife. Canadian wetlands support a variety of species, including 35 of the species considered threatened or endangered in the country. Similar statistics are not

available for the Non-settled Area in Alberta. However, trumpeter swans, found in the Grande Prairie area, are dependent on forested wetlands for habitat. Bogs are essential habitat for woodland caribou, also considered a threatened species. Wetlands may provide travel corridors for some wildlife species.

Generally peatlands have a lower overall productivity and lower species diversity than marshes and swamps, because of the lower nutrient level and less varied habitats. However, many animals still use peatlands, although often for only some of their needs. For example, moose or bears may browse on peatland vegetation, but would not remain exclusively in the peatlands. Waterfowl may use fens with open waters for habitat when other preferred habitats are dry.

Marshes and shallow open water areas, as well as some nutrient-rich fens, are more productive wetlands than are peatlands. They provide habitat for animals such as beaver and muskrats, as well as migratory waterfowl including ducks and geese. Two locations in the Non-settled Area have been designated as wetlands of international importance for migratory waterfowl. They are the Hay-Zama complex in northwestern Alberta and the Peace-Athabasca delta in the northeast (Figure 3). In addition to these areas, the Utikuma Lake complex is considered very important waterfowl habitat in the province. Research has shown that marshes in the boreal forest are as productive as wetlands in the parkland area of the province (Lumbis 1992).

The wetlands in northern Alberta, in both the Settled and Non-settled Areas, provide important habitat for duck populations, for production, rearing, moulting, and staging. The data on duck breeding populations are collected in two major areas: southern Alberta, which corresponds roughly to the Settled Area of the province (excluding the Peace River area); and northern Alberta, which includes most of the Non-settled Area (excluding the Eastern Slopes) as well as the Peace River area. Therefore it is difficult to distinguish the importance of wetlands in the Non-settled Area versus the Settled Area in the available data. However, some estimates indicate that the boreal forest of Northern Alberta provides habitat for approximately half of Alberta's population of breeding waterfowl.

The relative importance of the northern wetlands appears to be increasing, as the extent of wetland areas

in the southern area of the province decreases. For example, mallard populations in northern Alberta have remained relatively consistent over the past 20 years although the breeding populations of mallards in southern Alberta have shown dramatic declines since 1970. Furthermore, the northern water resources tend to be more stable and consistently available than in the southern region. Northern wetlands are particularly important for some species, like mallards, in drought years, because they will overfly the drought-stricken south and nest in the north instead. For other species, such as the pintail duck, the northern resource is not a suitable substitute, as they would bypass the entire province and nest in the Arctic if southern Alberta were undergoing a drought.

Chemical Functions

Wetlands play an important role in nutrient and energy flows in the global ecosystem because of their extensive distribution. Of particular interest in light of concerns about potential climate warming is the storage of carbon in peatlands in the accumulated peat. It is estimated that 10 percent of the continent's carbon supply is locked in peatlands (Kuhry 1992).

Carbon is stored in organic matter which accumulates as peat in peatlands. Carbon is also released as carbon dioxide and methane through plant respiration and decomposition. In Alberta's peatlands, more carbon is stored than is released. Therefore, our peatlands are net absorbers of carbon. Our peatlands store about 3 percent of the province's total carbon dioxide emissions. Although this is a small amount compared to the 24 percent storage by the boreal forest (Anielski 1992), it is still a valuable function. If another technique had to be found to replace carbon storage by Alberta's peatlands, estimates indicate it could cost between \$22 million and \$339 million (Anielski 1992).

Some wetlands also act as sediment traps and may prevent excess nutrients from reaching a water body by incorporating the nutrients in plant material.

- 1 Hay-Zama Complex
- 2 Peace-Athabasca Delta
- 3 Utikuma Lake

 Settled (White) Area of Alberta
 Non-settled (Green) Area of Alberta

Figure 3: Location of Hay-Zama, Peace-Athabasca Delta, and Utikuma Lake Areas



Wetland Uses

Timber Harvesting

The most extensive land use in the Non-settled Area is timber harvesting. Timber harvesting has the potential to significantly impact wetlands in the province in several ways. First, logging activities may directly or indirectly affect wetlands, depending on where the wetland is in relation to the harvest area. Direct impacts would occur where the peatland supported enough timber to allow harvesting. Indirect impacts could occur where harvesting occurred on an adjacent upland. Second, road and bridge construction to give access to timber harvesting areas may also directly or indirectly affect wetlands.

A number of impacts may result from timber harvesting activities. The soil may be compacted from traffic. Wetland soils, especially on sites with high water tables, may consist of moderately to well decomposed soils which are sensitive to erosion. The removal of vegetation may cause underlying permafrost to melt, resulting in soil subsidence and possible erosion. This in turn may alter surface water drainage patterns. Drainage patterns may also be disrupted due to soil compaction or road construction, and this could affect the wetland hydrology. Harvesting may also result in reduced interception of precipitation by vegetation, possibly causing increased runoff. With less vegetation in the area, less water will be used by the plants which could cause the water table elevation to increase. The impacts of timber harvesting on peatlands or any adjacent wetlands is difficult to predict, as is the impact of the activities on the hydrology of the watershed.

Alberta Environmental Protection exercises control over forestry practices by approving preliminary, detailed, and operational plans for harvesting, and setting ground rules for harvesting. The department places conditions on harvesting and plant site permits to minimize the environmental impact of the harvesting activities. These conditions include: winter harvest, to limit impacts on wet soils and to reduce soil erosion; bridge or culvert installation to maintain drainage patterns; allowance for buffer zones along streams and lakes; and the use of wide-tired vehicles to limit surface impacts (see Chapter 6).

Drainage for Enhanced Timber Growth and Reforestation

Many peatlands, particularly forested fens, do not produce sufficient volumes of timber to be harvested economically. However, it is possible to increase timber growth rates and timber production through wetland drainage. Drainage may also be used to lower the water table in areas that are too wet for tree seedlings to become established, to increase reforestation success.

Drainage involves installing ditches to allow groundwater to flow away from a site. By lowering the water table, the amount of oxygen available to the roots increases and tree growth is stimulated. Drainage does not mean removal of all water from a wetland, but usually involves decreasing the water table elevation less than 0.5 metres (2 feet) from its previous elevation.

Only some types of peat are suitable for drainage to increase timber growth. The peatland must be able to support trees. Sphagnum bogs are acidic, do not support significant tree growth, and would not be as suitable for drainage as fens. The peat must be permeable enough to allow water to drain, while retaining sufficient moisture and nutrients to sustain the tree growth. The area must be sloped appropriately to allow water to drain away.

Drainage has not been used as a silvicultural treatment in Alberta, because of the abundant timber supply on upland sites. Currently the costs associated with drainage would exceed the value of the expected additional timber growth. However, wetland drainage may become more economically viable if timber supplies were to decrease or if a market were developed for black spruce, the dominant tree species found on peatlands in Alberta. Hillman (1987) estimated that as many as 4 million hectares of peatlands (29 percent of all provincial peatlands) may be suitable for forestry development through drainage.

Many factors affect tree growth response to drainage, including type and depth of peat, regional groundwater conditions, type of underlying mineral soil, and climate. It has been demonstrated that under the conditions prevalent in Finland, peatland drainage has been a successful technique to increase timber production. It is difficult to predict whether peatland drainage would be successful in our province, because of the different

conditions in Alberta, especially with respect to the cooler, wetter climate, and fewer forest fires (Hillman 1987).

Research programs were established in the 1970s and 1980s by the provincial government to evaluate the effectiveness of drainage to increase timber growth in Alberta. Eight drainage trials have been initiated since 1975. Forestry Canada continues to monitor some of these sites as part of the joint federal/provincial forestry agreement. Long-term research, over decades, is necessary to evaluate the effects of drainage on timber growth. Preliminary results indicated that rates of tree growth increased following 3 to 7 years after drainage was initiated. Between 1975 and 1989 approximately 1700 hectares of peatlands were drained for experimental purposes.

Some water quality parameters were measured as part of drainage trials initiated in the 1980s. The drainage waters in the trial projects in Alberta were collected in sedimentation ponds. This allowed sediments to settle before the water was discharged through a vegetation buffer, either on undisturbed peatlands or upland areas, into surface water courses. Initial results indicated that the drainage discharge contained large sediment loads, especially following major storm events, but that most water quality parameter concentrations either did not increase significantly, or did not increase to a point where they would cause damage to fish populations in the receiving water body. Some research indicates an increased acid content in the waters drained from a peatland; however, the water is generally not as acid as that found within the peatland originally (Hillman 1987).

A number of environmental impacts are associated with peatland drainage. Drainage has the potential to change the physical and chemical characteristics of the peat, to cause peat subsidence, to affect the water quality of the water body receiving drainage runoff by changing the water chemistry or by adding silt to the stream, to change the vegetation composition of the peatland, and to alter the regional groundwater conditions. Drainage may cause permafrost to melt, increasing subsidence. The effect of forest drainage on the quantity and timing of stream flows in Alberta is largely unknown (Hillman et al. 1990: 60). The ecological impacts of drainage on wildlife habitat, species composition, endangered

species protection, aspen propagation, or climate warming are not well understood.

Horticultural Peat Extraction

Peat is defined as the accumulation of partially decomposed organic matter. Peat moss is one type of peat that is formed from various mosses, including *Sphagnum* species. Peat moss is most commonly used as a growing medium in greenhouses or as a soil conditioner to increase its ability to hold moisture. Peat moss retains sufficient water for plant use, but drains well enough to prevent root rot, and is lightweight and inexpensive, making it a good growing medium. Peat moss has also been used experimentally to compost hog manure. In Ontario and Quebec, peat is also harvested for an absorbent in industrial materials, diapers, and feminine hygiene products. Most peat moss harvested in Alberta is shipped to the United States for growing plants.

Two peat harvesting techniques are used in Alberta. Both require drainage to lower the water table in the desired area to allow access and to dry the peat moss. Small operators harvesting peat for local gardens and greenhouses use a backhoe to remove the peat for drying and hauling. One public peat pit where this technique is used is located on Non-settled Area public land near Fort McMurray.

For large commercial operators, peat is harvested by the milled method. The surface vegetation and roots are removed, and ditches are installed around the perimeter of the field and on 30 metre to 40 metre spacings throughout the bog to lower the water table. Drainage is designed to reduce the water table elevation only 30 centimetres to 40 centimetres. Larger decreases in the water table are not desirable, as too much peat would be exposed to the air, and decomposition would occur. Drainage requires a licence from Alberta Environmental Protection. After the surface is broken up, the peat is allowed to dry slightly in the presence of sun and wind. This partially-dried peat layer, usually only a few centimetres thick, is then collected using a vacuum harvester, and the process is repeated. Because the peat still contains a significant amount of water, it is dried in a furnace before packing. Packaged peat may contain as much as 40 percent water by weight following this processing. For more detail on peat harvesting, please refer to *Canadian Peat Harvesting and the Environment* (Keys 1992).

A number of factors determine whether a peatland is suitable for harvesting. Bogs which contain Sphagnum mosses are potential harvesting sites. The area must be one that can be drained relatively easily. The tree cover should be low to minimize clearing costs and the proportion of roots in the peat. The climate must be appropriate to allow some natural drying of the peat. The peat must be of high quality (fibrous) and thick enough to warrant harvesting (usually more than 2 metres thick). The site should be located close to transportation, labour, and power supplies.

Individual bogs may be only several hectares in size, but at least 50 hectares (124 acres) of suitable bogs should be available within a given area to make commercial processing economical. Peat harvesters may use anywhere from 5 hectares (12 acres) to 2000 hectares (4950 acres) depending on their scale of operation, but in Alberta, individual deposits of a quarter section (160 acres, or approximately 60 hectares) are considered large. A 20 year reserve of harvestable peat is desirable.

Currently, horticultural peat operations are located within 160 kilometres of Edmonton, primarily in the settled portion of the province. In 1991, a total of 5315 hectares (13 130 acres) of public land were under lease for peat operations. In 1991, 20 leases were held by 14 lessees, but only 5 leases (2295 hectares) were in production. Individual lease sizes ranged from 5 hectares to 877 hectares. These figures do not account for peat harvested from private land.

The area of bogs currently being used for peat production accounts for approximately 0.04 percent of the total peatlands in Alberta. However, it is estimated that only 16 percent of Alberta's peatlands consist of bogs which are likely to contain the Sphagnum mosses appropriate for horticultural peat. Therefore, the area currently under production represents only 0.24 percent of the total area of bogs in the province (Tedder 1992). Most of these bogs are located in the vicinity of Edmonton. These statistics may be misleading because all of Alberta's bogs will not be suitable for peat harvesting, whether because of limitations in the type and supply of peat, or in the accessibility to markets. Existing commercially viable horticultural peat resources in the Settled Area close to Edmonton are being depleted, and within 20 years expansion onto new leases in the Non-settled Area is inevitable. Commercial operators are

currently limited to using peat resources within a 300 kilometre radius of Edmonton because of the economics of transporting peat to distant markets.

The province charges a royalty on peat extracted from public lands (\$0.05/cubic yard), as well as rent on the leased property (\$2.47/hectare or \$1/acre). Alberta's royalty rate, constant since the 1960s, is comparable to royalty rates in other provinces. In 1991, royalty and rent generated \$34 000 for the province (Tedder 1992).

Four communities are the focus of peat harvesting operations in the province: Athabasca, Evansburg, Seba Beach, and Mallaig, all of which are located within 50 kilometres of the boundary between the Settled and Non-settled areas (Keys 1992). This emphasizes the importance of the peat industry in providing employment in rural communities, although it is usually seasonal employment. Estimates indicated that the peat moss industry contributed approximately 300 jobs to the Alberta economy in 1990. The 1990 peat moss production was estimated to be valued at \$13.2 million (Canadian Sphagnum Peat Moss Association 1990). In 1990, the market value of the peat industry in Canada was \$90 million, and the estimated value of market garden crops grown on peatlands was an additional \$100 million. The industry was directly responsible for 1400 to 1600 person-years of employment, and most of these jobs were located in rural areas (Keys 1992). Of the harvested peat, 90 percent was exported to the United States, and the remainder went to markets in Canada and Japan.

Peat harvesting impacts the environment in several ways. Drainage to reduce the local water table has impacts on the groundwater regime, and on the water-course receiving the drainage. The natural vegetation and any wildlife habitat is destroyed during harvest. Furthermore, a bog will not usually return to a natural functioning bog following drainage and peat harvesting, as the hydrology and water chemistry have been altered. Research is being conducted on this issue to determine how to initiate natural restoration of the bog ecosystem. Although the exact ecosystem can not be replaced because part of the peat resource has been removed, actions can be taken to encourage bog plants to recolonize a harvested site, or to reclaim a harvested site as another wetland.

Fuel Peat Extraction

Certain types of peat may be extracted, dried, and burned to provide energy. Generally, moderately decomposed sedge peat from fens is particularly suitable. The requirements for fuel peat are usually different from those for horticultural peat operations. Currently the peat inventories are insufficient to determine how much peat in Alberta is suitable for fuel use. One source estimates that 10 million hectares of peatlands in Alberta could be physically suitable for fuel peat, although this number is based on limited information (Tibbetts 1979).

Peat has not been used as an energy source in Alberta, although the technology is available, but it has been used extensively in countries such as Finland and the former USSR. The unfavourable economics of developing the peat resource and the regulations which previously did not recognize peat as a fuel deterred development. Two pilot fuel peat projects were proposed recently in Alberta as a result of amendments to the Small Power Producers Act. The act, described in more detail in Chapter 6, specified peat as a form of energy, and provided guarantees of access to existing power distribution grids. The projects were proposed for peatlands located near the boundary between the Settled and Non-settled areas, but only one project is still under consideration as of Spring 1993.

The use of peat to produce fuel has the advantage of providing employment in the regions to harvest peat and operate the plant. However, it consumes large quantities of peat resources, over a large surface area. One proposed pilot project would cover 1620 hectares (4000 acres) to 2225 hectares (5500 acres). This area is approximately equal to the area leased by the entire horticultural peat industry in Alberta. The impacts of such extensive peat harvesting on factors such as the regional hydrology or wildlife are unknown. Furthermore, peat harvesting and burning would result in the removal of carbon storage capabilities and the addition of carbon emissions to the atmosphere.

Agriculture

In the Settled Area, peatlands are located on both public and private land. Alberta Agriculture, Food and Rural Development is responsible for day-to-day management of publicly held land that has already been allocated to

agricultural uses, although Alberta Environmental Protection will make decisions concerning land allocation. Individual landholders determine activities on private land. Public land in the Non-settled Area is generally not available for agricultural uses, except for grazing in some sections.

Some peatlands are suitable for different types of agricultural use, including forage or hay production, grains, or specialty crops such as carrots. The type of peatland most suitable for agricultural uses is a fen which does not have a dense forest cover. Peat composed of sedges is more suitable for conversion to agricultural uses than peat composed of *Sphagnum* mosses because it is less acidic, and more nutrients are available to the crops. Peat soils are most productive under warm climates and intensive management for high value crops, such as the Holland Marsh in Ontario or the Fraser Valley in British Columbia. Productivity is limited, compared to mineral soils, by shorter growing seasons, less available nutrients, and drainage problems, and erosion (Manitoba Peatland Farming Association 1990).

Several techniques can increase the agricultural productivity of peatlands. They include any combinations of: drainage to lower the water table; land clearing; removal of the peat (organic) soil by excavation or burning; fertilization; deep tilling of the organic soil into the underlying mineral soil; or seeding to tame forage species. Drainage involves lowering the water table by constructing drains around and through fields to allow water to flow away from the field.

Some drainage of privately owned peatlands has occurred in the area near the boundary between the Settled and Non-settled areas. The land has been used for forage, to grow grain, and in an experimental area near Barrhead, to grow carrots. With the exceptions of the Barrhead and Athabasca areas, the climate generally limits the productivity of peatlands, restricting their suitability to forage or hay. Farmers in Manitoba have been experimenting for several years with growing cash crops such as carrots on peat soils, but the peat soils in Manitoba are located further south than those in Alberta, and the climate is more suitable for specialty crops.

Some public lands are suitable for grazing. To maximize the agricultural benefit derived from using public peatlands for forage or grazing, the land should be

cleared, seeded, drained, and nutrients added. Most peatlands used in Alberta for grazing have only been cleared; the subsequent treatments have not been applied. Currently drainage of public lands for agricultural purposes is not encouraged, and the area of peatlands that will be considered for grazing leases is limited.

Harvesting of Renewable Resources

Various plants and animals can be harvested from wetlands without permanently disrupting the functioning ecosystem, including waterfowl (through hunting), fur-bearing animals (through trapping), marsh hay, and to some extent wild rice. Nationally, the value to Canadians of wetland sport-fishing and hunting alone was \$1.43 billion annually (National Wetlands Working Group 1988).

Statistics are scarce about the value of renewable resources harvesting from Non-settled Area wetlands. More than \$1.6 million was earned by natives trapping muskrat in 1978 in the Peace-Athabasca delta, which is partly located within the Non-settled Area (Usher and Scarth 1990: 11). It is estimated that the value of all of Alberta's wetlands to the fur industry in the province was \$22.3 million in the early 1980s (Usher and Scarth 1990: 11). Similarly, the value of hunting from marshes was \$38 million (Usher and Scarth 1990: 11).

Tourism and Recreation

Wetlands of all types provide opportunities for enjoyment and recreation. They can be sites for wildlife viewing and photography, hiking, hunting, cross-country skiing, personal renewal, or enjoyment of the scenic values.

On a commercial level, tourism and recreation present an opportunity for economic diversification appropriate for the northern part of the province, a large part of which is in the Non-settled Area. Ecotourism is seen to be an appropriate northern development tool because it requires only a small capital investment, and it can be controlled by local operators, providing the land base is secure. The expanding ecotourism industry will depend on a supply of wild land as a base for wilderness experiences. The results of a study titled *Commercial Recreation Opportunities in Northern Alberta* (Forestry, Lands and Wildlife 1990: 18) indicated that "if the

recreation/tourism industry is to thrive in the north, the wilderness and wildland resources (land, water, wildlife, etc.) must be preserved and conserved in substantial portions."

Education and Scientific Understanding

Significant or representative wetlands may be useful for educational or scientific purposes. Wetlands can be used as outdoor classrooms to teach people about plants and animals, as well as ecological principles such as biological diversity, energy flow and recycling, and carrying capacity.

Wetlands are important scientific laboratories. Our understanding of wetland functions, and their importance to us, is by no means complete. Peatlands represent a record of past climate and vegetation in the spores and pollen contained in accumulated peat. The peat record may extend as far back as 5000 or 6000 years. This information may be useful to study the impacts of climate change on vegetation, which in turn may lead to a better understanding of current climate change. Most peatland research studies have concentrated on the relatively accessible areas located along the southernmost extent of peatlands. Our understanding of wetlands located farther north in the peatland region is limited.

Existence, Option, Bequeath Values

Existence, option, and bequeath values can be associated with wetlands. Existence value refers to the value that people place on knowing that a certain type of ecosystem is in existence, whether or not they will ever visit or experience it. Option value is the value placed on maintaining options for the future. Bequeath value is the value derived from knowing that a particular ecosystem will be available to be "passed on" to future generations, for their use and enjoyment.

Waste Water Treatment

Wetland plants, particularly marsh vegetation, have the ability to take nutrients such as nitrogen and phosphorous out of waste water and store them in plant tissue. This function makes marshes useful for removing excess nutrients from treated waste water before it is discharged to a watercourse. It does not replace tradi-

tional sewage treatment methods, but is used as an additional treatment technique.

Wetlands are being used for waste water treatment in the Settled Area of Alberta, as well as in American jurisdictions. However, wetlands have not been used in the Non-settled Area for waste water treatment, although there is interest in exploring this option. The limitations posed by the colder climate in the Non-settled Area have not been determined yet.

Activities with Indirect Impacts on Wetlands

In addition to the wetland functions and uses described above, various activities occur in the Non-settled Area and on peatlands in the Settled Area that may impact wetlands, although the activities are not specifically wetland-related.

- **Acid Deposition**

Acid deposition has the potential to change the chemistry of wetlands, affecting the plant communities by increasing acidity and allowing Sphagnum mosses to invade. Sulphur and metals may be accumulated in the peat moss, and could be released later if the water table were to decrease. The impacts of acid deposition on carbon dioxide and methane cycles has not been evaluated (Gorham 1987).

- **Climate Warming**

The effects of climate warming on the methane and carbon dioxide cycles of wetlands are largely unknown (Vitt et al. 1990). Climate warming may decrease the ability of wetlands to accumulate carbon. It may alter the water balance, for example by increasing evaporation rates, or causing the water table elevation to decrease. In addition, warming may destroy some or all of the permafrost, and the impacts of that on peat deposits are unknown. The frequency of fire events may increase. Climate warming may change human settlement patterns, altering the area where human impacts on wetlands occur.

- **River Regulation**

Regulation of river hydrology, for hydroelectricity production or flood control, changes the pattern of river flows and may negatively affect wetlands. Changes occurred in the wetland complex in the Peace-Athabasca delta following construction of the

W.A.C. Bennet dam in British Columbia. This is one example where hydroelectric development has been associated with wetland deterioration.

- **Oil or Brine Spills**

Oil and gas exploration and development occurs in many areas covered by wetlands. Spills of hydrocarbons or salty water (brine) are more difficult to clean up from wetlands than from uplands or surface water. Brine spills in particular cannot be handled by flushing, the common method used in upland areas, because the water does not circulate sufficiently to remove the contaminants.

- **Oil Sands**

Oil sands mining has the potential to impact a huge surface area. Oslo, Syncrude, and Suncor all have access to extensive land bases south of Wood Buffalo National Park which include wetlands. Concentrated development within a watershed or sub-basin may impact the regional hydrology. Development of the oil sands resource will be a function of technology and world oil markets, and its timing is difficult to predict.

- **Infrastructure Development**

Roads may be constructed in the Non-settled Area to provide access to timber, oil and gas resources, recreational developments, or settlements. Cut lines may provide access for seismic activity. Tourism or industrial infrastructure, such as plant sites, may be constructed. Any of these activities can cause subtle changes in groundwater or surface flow such as local damming or drainage. This can cause significant changes in species composition, altering the wetland type. Activities which may remove surface vegetation can expose permafrost, causing it to melt. This could result in surface subsidence and changes in drainage patterns. Regeneration of natural vegetation may be slow in disturbed areas because of the high water table. Recreational lake use may result in drainage or infilling of wetland areas along the lake edges for cottage construction.

Summary

Chapter 3 has demonstrated that provincial peatlands and slough/marsh wetlands in the Non-settled Area of Alberta are not wastelands. They provide functions and

benefits necessary to maintain or improve our standard of living. They are also unique ecosystems in their own right. Wetlands in Alberta perform many functions, including affecting the hydrologic cycle and providing habitat for various plants and animals. It is difficult to generalize about most wetland functions for several reasons. First, wetland functions vary with wetland type and location. Second, our level of knowledge about wetland functions, particularly for peatlands, is not advanced. Third, extensive data have not been collected to date about wetlands in the Non-settled Area.

We make use of wetlands and wetland resources in many ways, including peat harvesting, timber harvesting, outdoor recreation, and scientific study. Numerous other activities, such as oil and gas exploration or road construction may also have an impact on wetlands, although the activities are not directly related to wetlands.

This variety of wetland functions and uses provides a challenge to policy makers. The wetland policy for the Non-settled Area must balance these different functions and uses, ensuring that one is not consistently favoured over another. This is especially difficult because it is easier to place a value on some wetland uses, although this does not necessarily mean they are more valuable than other uses. When wetland values are evaluated, it is necessary to consider both the regional and national perspectives, the monetary and non-monetary benefits, the costs associated with converting a wetland to another use, and the possible future values compared to the existing values. The policy must also ensure that wetland functions and uses are considered when decisions are made about other activities with indirect effects on wetlands.

Chapter 4: Principles for Wetland Management

Chapter 3 described the many functions of wetlands, and the values that we place on those functions. This chapter summarizes the basic facts about wetlands in seven categories, and presents the principles for wetland management that follow from these facts.

1. Wetlands are an integral part of our environment.

Wetlands are an integral component of our environment. They are areas where complex interactions occur between land, water, vegetation, and wildlife resources. Wetlands perform vital ecological functions, including habitat provision, nutrient cycling and storage, water storage and purification, and groundwater recharge. Wetland management must be coordinated with associated land, water, air, and wildlife resources in the surrounding watershed.

Wetlands should be managed as ecosystems. They are an integral and important part of our environment.

2. Regional variations exist in wetland resources and our demands on them.

Different wetland types are located throughout the province. Wetland types, areas, and abundance vary regionally. The demands on wetlands, as areas for preservation or as sources of economic development opportunities, also vary regionally. The most common classes of wetlands in Alberta's Non-settled Area are bogs and fens, although marshes, open water, and to a lesser extent, swamps, are also present.

Peatlands (bogs and fens) are quite different ecosystems than marshes and require different management strategies. Because peat accumulates very slowly, it can be considered a non-renewable resource. The technology and experience to recreate peatlands does not exist as it does for other wetlands such as marshes. Strategies that work for marshes in the Settled Area of Alberta may not apply to managing peatlands in the Non-settled Area. Similarly, management experiences in other jurisdictions may not apply to Alberta.

Wetland policy and management should recognize the variability in wetland type, size, distribution, functions, and significance, in different regions of the province.

3. A variety of values are associated with wetlands.

Different individuals or groups may place different values on wetland functions and these values may change over time. Value may be derived from some wetland ecosystems by using them in a consumptive manner, whereas some values associated with wetlands will require conservation (wise use) or preservation (protection from any human uses) of the ecosystem. Obviously, some uses will be incompatible, and may not be accommodated in the same area at the same time.

It is difficult to manage resources that have many potential values, both economic and non-economic. For example, wetlands can be the source of job creation and income through activities such as peat harvesting, cattle grazing, hunting, or provision of services related to ecotourism experiences such as bird watching. They can also be the focus of scientific study or personal recreation. Wetland management is further complicated because the benefits of certain uses such as peat harvesting go to specific individuals or companies but the costs of the altered ecosystem, such as changed downstream hydrology, is borne by the public.

Different types of wetlands have different social, economic, and environmental functions and values. This variety of values should be reflected in our decision-making processes.

4. Wetland management involves and affects many of us as groups and individuals.

The complexity and variety of wetland functions and values means that many individuals and groups are interested in wetland management. Furthermore, activities not directly related to wetlands, such as oil and gas exploration and development or construction of transportation routes may also affect wetlands, increasing the number of people who may have an effect on wetlands.

Wetland management involves and affects many Albertans. Public involvement in policy development and resource management is essential and should be supported by adequate public information.

5. Government departments at the national, provincial, and local levels have a role to play in wetland management.

Wetland management cuts across different areas of interest, as well as different government levels. Furthermore, actions affecting wetlands in Alberta may have local, national, or international implications. As a result, various government departments and agencies, as well as non-government organizations and individuals, share responsibility for wetland preservation, conservation, and management.

Government departments and agencies at local, provincial, federal, and international levels should cooperate in wetland management.

6. Our understanding of wetlands is limited.

We are just starting to recognize the complexity of wetland functions and to understand the importance of these different functions. The impacts of activities such as forest drainage on wetlands are only partially understood. Resource managers need a strong information base to draw on when making decisions about wetland management.

Wetlands should be managed using the best available information, as it is obtained, recognizing the uncertainty inherent in the information. Ongoing research to improve our understanding of wetland functions and values is necessary.

7. Some wetlands, particularly peatlands, form very slowly.

The impacts of wetland management decisions may have short term consequences, or may have impacts over the longer term. For example, decisions to drain peatlands to increase timber yield may positively affect the value of the timber resources, but may alter the ecosystem over time so that certain wetland species may no longer thrive there. Resource values in the future must be weighed along with current benefits.

Options for future generations should be retained as much as possible. This is especially important for peatlands because they may take hundreds or thousands of years to form.

Chapter 5: Policy Tools

Several policy options exist to allocate wetland resources, ranging from no allocation at all for any conversion uses, to totally unrestricted allocation as requests are received. Obviously neither extreme is desirable. A policy of no further allocation would not allow the wetland resources to be developed to provide specific economic benefits to Albertans. Similarly, allowing uncontrolled allocation would not ensure that the public values associated with wetlands were maintained. Therefore a policy which will accommodate the range of desired values, from wetland preservation to the use of non-renewable resources in a wetland, is required.

As discussed previously, the government, with the assistance of the public, is developing wetland policy for the province, and is currently addressing provincial peatlands as well as Non-settled Area slough/marsh wetlands. Any policy statements recommended for this area should consider the overall provincial goal for wetland management, contained in *Wetland Management in the Settled Area of Alberta: An Interim Policy* (1993), which stated that: “the goal of the Government of Alberta is to sustain the social, economic and environmental benefits that functioning wetlands provide, now and in the future.” The policy should also respect the principles established in Chapter 4. The policy for the Non-settled Area will be somewhat different from that of the Settled Area because the conditions surrounding wetland management in the Non-settled Area are different. Several tools are available to allocate the wetland resources in a manner which satisfies our wide range of objectives. They include:

- ad-hoc decision making;
- wetland classification and evaluation;
- land use planning;
- formalizing a project evaluation process;
- establishing a protected places network;
- creating “stockpiles” of wetlands for future uses;
- coordinating wetland interests using a new agency or improved coordination structures;
- implementing incentives or disincentives to affect behaviour;
- educating public and government; and
- using legislative mandates and regulations.

Each of these tools is described below, with an example of its application and the advantage or disadvantages outlined.

Ad-hoc Decision Making

In the absence of a wetland policy, requests for wetland resources in the Non-settled Area of the province are addressed on a case-by-case basis. Resource allocation decisions are made based on the current understanding of wetland functions and values. The proponent, such as a horticultural peat harvester, must provide most of the wetland inventory information, as well as an assessment of potential development impacts and proposed reclamation schemes, if appropriate. Decisions about resource allocation are made following input from involved departments, through a coordinating mechanism which has developed over time. Generally Alberta Environmental Protection is responsible for deciding on allocation.

Wetland Classification and Evaluation

A classification and evaluation approach to wetland management requires the inventory and evaluation of all wetland resources. Wetlands would be classified or zoned based on an objective evaluation scheme. Potential uses, including conversion, conservation, or preservation uses would be permitted in designated wetland classes. Classification could be based on provincial or regional scales. Proposals for wetland uses would be evaluated by their compliance with the established classification or zoning. Alterations to the classification would require detailed comparison of the proposed benefits from the development to those of the wetland in the specified use.

Essentially this is the process used in Ontario to manage wetlands in the southern part of the province. The wetland resources were evaluated using an objective procedure, and were classified into 7 classes. Approximately 10 years passed between Ontario’s initial work to develop its evaluation system and the announcement of the wetland policy. The majority of southern wetlands in Ontario have been classified, but most of the boreal wetlands have not been classified. The Ontario

wetland policy (1992) specifies that no development that would cause a loss in wetland area or function will be permitted on the three highest classes of wetlands. Development restrictions on wetlands of lower classes are correspondingly less stringent.

A classification and evaluation approach would clearly specify to project proponents what type of activities would be acceptable within certain wetlands. However, this would be an extremely expensive and time-consuming process in the Non-settled Area of Alberta, as an objective wetland classification system would have to be developed first then applied to each wetland area. A ranking system is difficult to design, especially when our understanding of peatlands in particular is limited. Currently we do not have a full enough understanding of our wetlands, their functions and values, to adequately classify them without extensive field research.

Land Use Planning

A framework of regional objectives for wetland management would provide guidance as to which development or preservation requests would be appropriate in a given region. For example, a regional objective might state that only scientific or recreational uses of bogs would be allowed in an area where few bogs remained. This model of regional objectives is being suggested for wetland management under the interim Settled Area policy.

Regional objectives allow local priorities to be incorporated in the decision-making process. Objectives could be determined by a public process. Development would be permitted where appropriate. The major drawback would be the time it would take to collect the inventory information and public input necessary to establish the objectives.

Formalized Project Evaluation Process

A formalized process would be used to evaluate any development proposal comprehensively and objectively in light of its impact on wetland resources. The benefits of a development that would impact a wetland would be compared to the specific benefits of retaining the wetland in its natural state. Social and economic benefits, as well as cumulative environmental impacts of

development on the wetland resource would be evaluated. Decisions about wetland uses would still be made on a case-by-case basis, driven by development proposals.

The *Wetland Evaluation Guide* (Bond et al. 1992), developed by the federal government in conjunction with its wetland policy, is an evaluation process that incorporates an understanding of wetland functions and values into the decision-making process. The recommended process is hierarchical. Some straightforward decisions could be made on the basis of existing data, while other more complicated decisions may be more difficult, and would require a greater understanding of the specific factors involved in the project. This process is similar to an environmental impact assessment. However, because of its hierarchical structure, it would be applied to all proposals, not just those of a certain size or public profile.

This tool has a number of benefits. It encourages wetland management on an ecosystem basis and balances development and preservation and considers future uses. A formal, comprehensive evaluation would specify the values which would be lost or gained if a project proceeded and would identify areas where mitigation of impacts would be possible and appropriate. It would provide a clear and consistent decision-making process, which would allow project proponents to reasonably assess their chances of success and the level of information which would be required. The project evaluation would apply to any project with a potential to impact wetlands. However, to implement formal project evaluation, the province must develop its own evaluation process, or adapt the federal evaluation guide to meet specific Alberta needs.

Protected Places Network

The government would undertake an inventory of provincial peatlands and all slough/marsh wetlands in the Non-settled Area to determine which areas should be afforded some type of protection from direct or indirect impacts of development such as peat extraction, silvicultural drainage, oil sands mining, or tourism infrastructure construction. Areas could be chosen based on the special functions they provide or wetland ecosystem types they represent. Essentially this strategy was proposed in the draft peatland management strategy

prepared by the former Forestry, Lands and Wildlife department.

An established network of protected areas would serve to maintain the public values associated with wetlands such as provision of habitat, hydrological functions, or recreational opportunities. Some activities, such as hunting or research, could be permitted in certain areas, as long as the impacts were minimized and did not significantly alter the functions of the ecosystem. Existing protected area legislation and strategies could be used to designate areas. It would take some time to evaluate all wetlands for protection. However, some preliminary work has been completed in this area by the University of Alberta. As our understanding of wetlands increases, and as pressures on some types of ecosystems increase, the need for protected areas may change, requiring additional areas to be protected.

Stockpiles

“Stockpiling” is a technique of accumulating and storing resources when they are plentiful to allow them to be used in times of shortage. It acts as insurance against a time when the demand on the resource is greater than the supply. Traditionally it has been used for resources such as oil, where nations maintain a stockpile of oil resources to ensure that affairs are not significantly disrupted in the face of a short term supply problem.

Stockpiling could be applied to wetland resources as a hedge against changes in future demands and wetland values. It would involve setting aside some wetland areas in a type of land bank where development or use of any consumptive or conversion nature would not be permitted for a specified time frame, say 10 or 20 years. In effect, it would be a form of temporary protection for future uses. The land would not be preserved forever, but would be available for possible development uses in the future.

Some American jurisdictions allow a form of resource stockpiling to meet requirements for replacing wetland area lost due to development. A developer can create new wetlands, in effect stockpiling wetland resources against future demands on existing wetland resources.

By using the stockpiling technique, the government could maintain some flexibility to make land use alloca-

tion decisions in the future when the types and extent of demands on wetland resources might have changed substantially. Obviously a resource manager does not have the knowledge to know which wetland ecosystems may be valued by future generations but some stockpiling now would provide insurance against future demands.

Coordination Mechanisms

Because of the variety of interests involved in wetlands, it is necessary to coordinate activities among different government departments as well as non-government organizations. This can be accomplished by strengthening existing coordination mechanisms, by establishing a wetland committee, or by creating an agency responsible for coordinating wetland management.

Alberta currently uses coordinating mechanisms to review certain wetland-related issues in the Non-settled Area, such as applications for horticultural peat extraction. The province has also established an interdepartmental wetland committee responsible for implementing the Settled Area wetland policy. Saskatchewan has opted to create a special wetland agency. The Saskatchewan Wetland Conservation Corporation was established in 1990 to oversee wetland management, particularly with respect to implementing the North American Waterfowl Management Plan.

Each mechanism has its advantages, depending on the nature of the organizations, the issues, and the people involved. Given the current reduction of the public service in Alberta, it is expected that creating an agency specifically charged with wetland management would not be feasible.

Incentives and Disincentives

Many tools could be classified as incentives or disincentives, meant to alter the behaviour of individuals or groups in a particular fashion. They could include tax incentives, funding, or education. For example, increasing the royalty charged for harvested peat or increasing the detail of information required for an environmental impact assessment may act as a disincentive for development. Incentives and disincentives are used throughout government policy. Review of agricultural incentives which might have a negative impact on

prairie wetlands was one component of the Settled Area policy.

Incentives are especially important to control activities on privately held land. Because many of the peatlands in the Settled Area, as well as the wetlands in the Non-settled Area, are public lands, the government can rely primarily on regulations to control activities affecting wetlands.

Education

Education is an important component of wetland policy. It ensures that the general public, the resource users, and the resource managers are aware of the many opportunities presented by wetlands, and the possible impacts of various development options. Education was identified as a critical component of the Settled Area wetland policy, as well as the federal Wetland Conservation Policy. The only drawbacks associated with education as a policy tool are the expense involved, and the time it takes to ensure information is transferred and new concepts are adopted.

Legislation

The government could use existing legislation, regulations, and mandates to direct wetland management, or it could prepare new legislation pertaining specifically to wetlands.

The provincial government has opted to continue managing wetlands in the Settled Area of Alberta within existing legislation and mandates that were not specifically developed to address wetlands. Similarly, the United States has relied on existing legislation to assist in wetland management. For example, Section 404 of the Clean Water Act is used to prevent wetland filling. However, the U.S. has also developed some specific wetland legislation. "Swampbuster" legislation allows the government to withhold all federal agricultural subsidies if a farmer is responsible for draining wetlands on his or her property.

New legislation might clarify management responsibilities of different agencies and identify what requirements could be placed on proponents with projects affecting wetlands. It could signal the importance of wetland management to government and public alike. Regulations could be written to allow the principles of the act

to be enforced. However, new legislation would take time to develop, and would not resolve the issue that several government departments have mandates that affect wetland management. Another problem with relying on legislation is the need to be able to strictly define a wetland. The Americans are continuing to struggle with this. Furthermore, it is often difficult to tailor regulations to the specifics of the wetland type and location. Wetland managers may have more flexibility to deal with the variety of wetland management issues in Alberta by using existing mandates and a policy for guidance.

Summary

In summary, many different tools are available to assist in allocating wetland resources. Each has its particular advantages and drawbacks. Some tools, such as creation of a new wetland agency or immediate inventory and classification of all wetlands in the province may not be feasible in the current economic climate. The challenge is to develop policy that will best serve the needs of Albertans within the existing constraints.

Chapter 6: Legislation, Policies, Programs and Organizations Affecting Wetland Management in Alberta

The previous chapters discussed the wetland resource in Alberta and how it is used. This chapter presents a summary of the legislation, policies, programs, and organizations that affect how Alberta's provincial peatlands and slough/marsh wetlands in the Non-settled Area are currently managed.

Provincial and federal legislation that may have implications for wetland management are described first. The acts are arranged by government department. For each act, the pertinent sections are summarized, and the possible implications of these sections to wetland management in the study area are discussed. The next section describes the provincial and federal policies pertaining to wetlands. Policies are statements of what a government considers important about an issue, and how the government will go about handling that issue. The numerous local, provincial, federal, and international programs which have an application to wetlands are then summarized by the department responsible for administering the program. Different organizations that have mandates directly or indirectly related to some aspect of wetland management are presented. Wetland policies and programs used in places outside Alberta are summarized to provide examples of how other jurisdictions are handling wetland management.

Where possible, material has been drawn directly from *Wetland Management in the Settled Area of Alberta: Background for Policy Development* (Alberta Water Resources Commission 1990), which included a detailed description of legislation having an effect on wetlands on public or private land in the Settled Area. Some material concerning legislative tools for ecosystem preservation was drawn from *Protecting Ecosystems in Alberta: A survey of government mechanisms* (Bramm 1992).

Legislation

At the time of writing, the provincial government departments were being reorganized. As a result, several of the acts described below will require amendments to reflect new department names and mandates. Every effort has been made to ensure the following material is as up-to-date as possible.

Alberta Environmental Protection

Environmental Protection and Enhancement Act

The Environmental Protection and Enhancement Act provides a framework for environmental protection and enhancement by consolidating nine previous environmental acts. The act was passed in the Legislature in June 1992. It is intended to integrate air, water, and land components of the environment, to streamline provisions, eliminate duplication, and facilitate public access. The legislation focuses on preventative action first (including consultation, communication, environmental impact assessment and approvals), remedial actions second (environmental protection orders) and finally enforcement (Alberta Environment 1992). Six components of the act have the potential to impact Non-settled Area wetlands, including: the powers of the Minister to enter agreements with land owners to protect and enhance the environment; environmental assessments including approvals and conditions for projects; release of substances; conservation and reclamation; enforcement; and research.

Ministerial Powers: Under Section 22(1), the Minister may enter into agreements with private land owners to restrict land uses for the current and successive land owners to protect and enhance the environment. This agreement may provide for compensation by the government to the landowner. It does not apply to public lands.

Environmental Assessments and Approvals: Part 2 of the act outlines the environmental assessment process. The environmental assessment principle is that environmental protection and economic decisions should be integrated into the early stages of planning. An environmental assessment is defined as the description of the possible environmental, social, economic, and cultural impacts of a proposed activity. Activities for which environmental assessments must be conducted are defined in the act and the forthcoming regulations. Although the current list of mandatory projects does not include any projects specific to wetlands, a director in the department may require an environmental assessment for any project subject to department review, if it

is deemed necessary. An environmental impact assessment will be one factor in determining whether a project should proceed. Project approval may be subject to conditions necessary to minimize impacts.

Release of Substances: Under Section 98(1), no one may release a substance into the environment that may cause a "significant adverse effect" where the release of the substance is not authorized by an approval or the regulations.

Conservation and Reclamation: Under Part 5, certain activities may be subject to conservation and reclamation requirements. This would require the project operators to undertake reclamation activities within a specified time following project completion. The objective would be to return the land to an equivalent land capability. It is not required that the reclaimed site be restored to its former use, just reclaimed to an equivalent capability. Reclamation requirements can include the payment of a security deposit to ensure reclamation is undertaken. Reclamation includes activities such as land surface contouring and soil stabilization to ensure the site is left in an environmentally acceptable manner.

Enforcement: Part 10 describes enforcement mechanisms which can be applied to ensure compliance with the conditions and orders described elsewhere in the act.

Research: Under Section 12(e), the Minister may coordinate and support environmental research. The formal continuation of the Reclamation Research Technical Advisory Committee (RRTAC) is established under the regulations associated with the conservation and reclamation section of the act. This committee is responsible for coordinating research about methods, standards, and criteria for reclamation and has conducted research concerning peatland reclamation following peat harvesting.

Possible Implications for Wetland Management: The ministerial powers could be used to allow agreements for protection of wetlands on private property, although this will have limited application in the study area where the land is predominantly public land. Project impacts on wetlands could be evaluated under the environmental assessment requirements. Specific peatland-related activities, including peat extraction or timber harvesting, are not considered activities for

which environmental assessments must be conducted. However, any director or the Minister of Environmental Protection may subject any project, including peat operations, to an initial review and possible environmental assessment. The authority concerning release of substances could be used to control an activity discharging a harmful substance into a wetland. Furthermore, this section could be used to control the release of waters from drained peatlands if they contained concentrations of substances such as heavy metals that might impact the receiving environment.

The conservation and reclamation aspects could have broad implications for managing project impacts on wetlands. However, wetland-related activities such as peat extraction are not regulated, and therefore are not automatically subject to conservation and reclamation requirements. The interdepartmental committee reviewing the project application could place conditions on operations to avoid, minimize, or mitigate impacts on wetlands. Reclamation guidelines require that an area be reclaimed to a productive site, not to its original condition. Therefore, a wetland site disrupted by development could be reclaimed as a pasture. However, the guidelines could require that a disturbed wetland be reclaimed as some form of functioning wetland. For example, a peat bog harvested for horticultural peat could be reclaimed as a marsh habitat, or restored to another bog (although one with a reduced peat accumulation).

Water Resources Act

All water in Alberta, surface and underground, is the property of the government under the Water Resources Act. This act gives Alberta Environmental Protection responsibility for managing the water resources of the province. The act is currently being reviewed by Alberta Environmental Protection, with support from the Alberta Water Resources Commission and the Environment Council of Alberta. Public consultation is continuing. A discussion draft of legislation and a policy guide are expected in 1993 for further discussion.

Principles for water management are being revised as part of the legislative review. The existing statement of principles (Alberta Environment 1983) does not specifically address wetlands. However, some general principles could affect wetland management indirectly,

including the commitment to water conservation, multiple-purpose use, water pollution protection, cost-sharing with local authorities, and intergovernmental cooperation.

Under the existing act, Alberta Environmental Protection issues a licence or permit for all diversion and use of water for water management, flood control, drainage, or erosion control, among other uses. The act also provides for enforcement of these requirements.

A natural state licence (Section 11) may be obtained to use water in its natural state for conservation, recreation, or fish and wildlife uses. It does not give the licence holder control over any water uses located upstream or downstream; therefore, the effectiveness of these licences for specific purposes, such as habitat maintenance, may be limited.

The act also allows for construction of works and undertakings by the Minister, alone or jointly with local authorities. It also provides a mechanism whereby public funds may be used for any water management purpose (Sections 83 to 95). The act also contains a “notwithstanding” clause by which the Minister may approve drainage projects without formal licensing (Section 64).

Possible Implications for Wetland Management: Provisions for licensing and enforcement of water drainage or diversion, as well as construction of works, give Alberta Environmental Protection some control over wetland development, although the existing act does not specifically address wetlands. Any development that required drainage or water table lowering would require departmental review and approval. Activities such as peat harvesting or drainage to accelerate timber growth would fit into this category. Enforcement provisions have been used successfully in cases where wetlands have been drained illegally. Only one natural state licence, for the Wagner Natural Area in the Settled Area, has been issued for wetland protection. The provisions for works and undertakings could be used to construct projects which could assist or possibly affect wetland management. Some activities, such as livestock watering, may not affect water resources to the extent that a licence is required but could potentially have a large impact on wetlands.

Department of the Environment Act

The act establishes the Department of the Environment and will require revision following the government reorganization in 1992. The current act allows the Minister to establish boards and committees as required (Section 6), and to enter into agreements with other governments (Section 8.1). It makes general provisions for expropriation of private land for programs aimed at the protection, enhancement, and wise use of the environment (Section 9). In addition, the act contains provisions for establishing water conservation areas (WCAs) and restricted development areas (RDAs) to protect areas from development that could degrade the environment or to separate a polluting operation or activity from sensitive adjacent land (Section 16). Development within these areas can be restricted or prohibited and the Minister of the Environment may purchase or expropriate any interest in land in these areas. The RDA designation is not meant to prevent all uses within an area, but instead allows the department and the Minister an opportunity to assess environmental impacts of land use change proposals on a case-by-case basis. To date, RDAs have been used primarily in and around major urban centres to protect river valleys or to maintain transportation/utility corridors. No water conservation areas have been established.

Possible Implications for Wetland Management: The definition of environment used in this act can be applied to wetlands as they are an “interacting natural system.” Provisions for intergovernmental coordination and private land expropriation could be used to achieve wetland management goals, although expropriation would only apply to the private land in the Settled Area. The RDA designation could be an effective tool for land use control and for wetland protection but no plans exist to extend the RDA designation.

Public Lands Act

Public land refers to the land held by the government in right of the people of Alberta and includes most of the Non-settled Area land as well as some of the peatlands in the Settled Area. Through the Public Lands Act, the government can allocate interests in public land to private individuals. These rights are called “dispositions.” This gives a person or company the right to use public land for a particular purpose, but it does not

necessarily mean they become owners of the land. Public land may be sold, used for parks, or leased for a variety of purposes including livestock grazing. Alberta Environmental Protection will be responsible for the act and Alberta Agriculture, Food and Rural Development will be responsible for day-to-day management of public lands with agricultural dispositions.

The act specifically prohibits activities on public land that may have impacts on the watershed capacity, or that may cause injury to the bed or shore of a permanent water body, or that are likely to result in soil erosion (Section 51). The act also forbids unlawful removal of peat, and authorizes the department to confiscate both the peat and the equipment used to remove it, if it is harvested without a licence (Section 49).

Various aspects of the Public Lands Act can be used to control or restrict activities occurring on public lands. Section 10 gives the Minister the power to classify land and to restrict land uses to limit negative impacts from development. The government may place terms or conditions on a disposition, or may place guidelines about how the land may be used now and in the future. The act also permits the government to cancel certain dispositions if the terms and conditions are violated. Cancellation of leases for most other reasons, such as creation of a park, is also possible but would require the government to compensate the lease holder. Some leases must be renewed every year, whereas others may have a limited term. In addition, the act also allows the government to charge a royalty for public land resources, such as peat.

Possible Implications for Wetland Management: The Public Lands Act gives resource managers extensive control over resource uses that occur on or may affect wetlands. Furthermore, Section 3 of the act gives ownership of the beds and shores of all “permanent and naturally occurring water bodies” to the government unless they are specifically granted in the title to private property. A permanent water body exhibits persistent evidence of a bank, bed, and shore, and a tendency to return to normal levels under ordinary circumstances after periods of drought or flood. This definition has been used to include permanent wetlands, such as marshes. Therefore, activities on public lands which may have a negative impact on the bed or shore of a permanent wetland could be prohibited under Section

51. Section 3 also ensures that any disposition of public land does not lead to title to the beds and shores of a wetland, allowing the government to maintain ownership of this resource. Conversely, on private land, the land under a non-permanent wetland is privately owned.

Forests Act

The Alberta Forest Service of Alberta Forestry, Lands and Wildlife administered this act. Following the government reorganization in 1992, Alberta Environmental Protection took over the duties of managing Alberta’s forests. Responsibilities include protection and conservation of the timber as well as water, fish, wildlife, and recreation resources. The act may affect wetlands in two ways: by controlling forestry activities which occur on peatlands; and, by controlling forestry activities on any public land which may have an impact on adjacent or downstream wetlands. The components of the existing act that have the greatest implications for wetland management concern regulations and operating guidelines, reforestation, recreation areas, and forest management agreements.

Regulations About Use and Operating Guidelines: The Minister may establish regulations and operating guidelines to limit the adverse effects of timber harvesting. For example, harvesting in boreal regions is usually restricted to the winter to limit the negative impacts of harvesting on sensitive wetland soils. Various parts of the act (sections 18, 20, 21) allow the government to require operating plans to be prepared by the harvesting companies and reviewed by government. This allows certain conditions to be placed on harvesting procedures to protect the land base and the watershed, which could include wetlands. Operating guidelines can specify buffer strips along watercourses, limits to cut block size, and cut block orientation. A licence may be cancelled if the operating rules are not followed.

Reforestation: The central principle of the act requires that timber be harvested on a sustained yield basis, ensuring that the rate of harvest does not exceed that of regeneration. Therefore, reforestation is necessary. The government may make regulations concerning all aspects of reforestation (Section 4). Although large licence holders are required to undertake their own reforestation, the department may undertake reforesta-

tion, on public or private land, for smaller operators (Section 41).

Recreation Areas: Section 46 of the act gives the Minister the power to designate areas of the forest land base as forest land use zones, forest recreation areas, or forest recreation trails. Each designation allows access and development to be restricted to permit other uses. Under Section 11, the Minister may order construction and maintenance of forest recreation areas and recreation trails.

Forest Management Agreements: Timber harvest rights and reforestation obligations may be assigned to an operator through a forest management agreement (FMA). Generally forest management agreements between the government and harvesting companies do not include any existing protected areas, large contiguous areas of land such as peatlands without merchantable timber, or beds and shores of all permanent and naturally occurring water bodies. Section 8 of each forest management agreement states that the company has the right to grow and harvest timber, but that the Minister reserves all land rights not specifically given in the agreement. These land rights could include: access for travel, fishing, hunting, recreation; maintenance or enhancement of fish and wildlife resources; trapping; or grazing. Each use would be subject to restrictions as necessary to control fire hazards or to protect roads.

It is possible to withdraw land from a forest management agreement area when the Minister considers it to be in the public interest (Section 26). Section 6 of the FMA describes two specific conditions of land removal. The Minister may remove land from the forest management area which cannot be logged without causing substantial harm to the water table, lakes, rivers, or streams. In this case, compensation is not made. The strength of this right has not been tested yet. Land may also be removed for rights-of-way, water resource development, or for other public purposes. Any land removed under these conditions, beyond an agreed limit, requires compensation to the agreement holder (Section 27). Most recently this limit has been set at 3 percent. Thus an attempt to remove land from an FMA for wetland preservation could require payment of compensation to the FMA holder. If a private citizen or company wished to have access to forest land already allocated for timber harvest, for example, for peat

harvesting, that individual or company would have to negotiate with the permit holder for compensation for access.

Possible Implications for Wetland Management: Approximately 40 percent of the Non-settled Area land base has already been allocated to various forest companies under forest management agreements. Therefore, FMAs are an extremely important component in the management of wetlands including peatlands in the Non-settled Area. Section 6 of the FMA could potentially be very valuable in controlling forestry activities on peatland soils that may not be easy to reforest. Reforestation requirements may be difficult to meet in areas with high water tables, or adjacent to wetlands. Often the water table elevation increases following harvesting, making it difficult for seedlings to become established. To facilitate reforestation, it may be necessary to implement drainage to reduce the water table elevation. Designation as a forest recreation area could protect wetland areas of recreational value from harvest; it could also protect areas from forest drainage.

Forest Development Research Trust Fund Act

This act allows the Minister to appoint a Forest Research Advisory Council to establish forest research priorities, coordinate forest research, and make allocations of research money from a specially-established fund. The council could direct and fund research into forest management issues which affect wetlands such as wetland drainage to enhance timber growth.

Wildlife Act

Under the Wildlife Act (Section 96 and Section 97), the Cabinet and Minister may make regulations concerning the establishment and management of wildlife sanctuaries and habitat development areas. Wildlife, game bird, seasonal, and corridor sanctuaries have been established to protect certain species in particular locations, whereas habitat development areas protect indigenous habitat or areas being restored or enhanced for wildlife. Furthermore, the Minister may also order a person responsible for wildlife habitat alteration to restore the habitat. The Fish and Wildlife Division may also recommend that reservations be placed on specified areas to restrict the type or timing of certain activities to protect habitat and to reduce wildlife harassment.

Possible Implications for Wetland Management: Wildlife habitat sanctuaries and habitat development areas could be established to protect and enhance wetlands as wildlife habitat. Land use reservations and directives from the Energy Resources Conservation Board (ERCB) have been used in the Hay-Zama wetland complex in the northwestern part of the province to protect its important migratory waterfowl staging areas. Similar directives and land use reservations apply to a number of important water bodies in the Non-settled Area to restrict the timing of oil and gas activities to minimize the impact on waterfowl.

Wilderness Areas, Ecological Reserves and Natural Areas Act

This act established three mechanisms to protect natural landscapes: natural areas, ecological reserves, and wilderness areas. Natural areas are established for educational, recreational, and conservation purposes on public lands that provide a relatively natural, undeveloped landscape. They are managed to maintain their features over time. To date, natural areas have been small, on average 3 square kilometres, but nothing in the legislation prevents designation of larger areas. Ecological reserves are established to protect areas of naturally functioning ecosystems that are representative of Alberta's six natural regions. The reserves are to act as outdoor classrooms and laboratories for educational and research purposes. Wilderness areas are intended to be large areas of undeveloped land, where significant wilderness landscapes are protected, and limited use, such as wilderness travel and camping, are permitted.

Some wetland areas are already protected under these categories. Three of the nine ecological reserves located in the Non-settled Area incorporate some significant wetland features. The Athabasca Dunes Ecological Reserve is 3769 hectares (9315 acres) in size. Although its main features are the sand dunes, some black spruce bogs have also been preserved. The Crow Lake Ecological Reserve is 938 hectares (2319 acres) in size, and includes patterned fens, marshes and bogs. It is representative of a subregion of the Boreal Forest natural region. The Marshybank Ecological Reserve (829 hectares or 2050 acres) is representative of a subregion of the Foothills natural region, and includes peatlands, sedge fens, and willow-birch wetlands. The three existing wilderness areas in Alberta are located in the

foothills, adjacent to the national parks, where wetlands are not extensive.

Possible Implications for Wetland Management: Any of these designations could be used to protect representative, rare, and unique examples of peatlands or slough/marsh wetlands in the Non-settled Area. It is possible that the wilderness area designation could be used to establish a boreal wilderness area that could encompass extensive peatlands.

Provincial Parks Act, Wilderness Area Acts

The Provincial Parks Act allows the Minister to designate provincial parks "for the conservation and management of flora and fauna" and "for the preservation of specified areas and objects therein that are of geological, cultural, ecological or other scientific interest."

The government could also draft legislation to protect a specific wilderness area, as it did with the Willmore Wilderness Park Act. Either a provincial park or a special wilderness park could be used to protect an area that included significant wetlands.

Alberta Agriculture, Food and Rural Development

Soil Conservation Act

The intent of the Soil Conservation Act is to encourage sound soil conservation practices to sustain Alberta's agricultural land base. It does not apply to any areas where the conservation and reclamation components of the Environmental Protection and Enhancement Act are in force. The act makes the landowner responsible for taking soil conservation measures to stop existing soil loss or deterioration and to prevent any further loss or deterioration. A number of mechanisms exist to encourage proper soil conservation techniques. The municipality or the Minister of Municipal Affairs (in the case of improvement districts) can intervene with a landowner using inappropriate practices. The responsible government authority can also pass bylaws concerning soil management practices, and fines can be imposed for ongoing infractions.

Possible Implications for Wetland Management: Some peatlands in the Settled Area are suitable for agricultural uses, but the soils are often susceptible to erosion. This act can be used to influence peatland farming practices in the Settled Area.

Department of Agriculture Act

The Department of Agriculture Act (which may require revision following government reorganization in 1992) contains provisions for three activities which may influence agricultural activities on peatlands. The act gives the Minister the authority to make loan guarantees to landowners for clearing, breaking, sloping, levelling, preparing, improving, or developing land for any agricultural purpose (Section 7). The Minister may, with approval of cabinet, purchase agricultural property that is deemed marginal, or that is required for conservation, utilization, or management of natural resources (Section 10). Finally, the Department of Agriculture, Food, and Rural Development may enter into joint agreements with other governments or agencies for research about equipment or agricultural practices.

Possible Implications For Wetland Management: The provisions of this act can be applied to agricultural activities on peatlands in the Settled Area and to land released from the Non-settled Area for agricultural purposes. Several implications are possible. Drainage or surficial peat removal could be considered land development, and thus be entitled to loan guarantees which could have adverse impacts on wetlands, although this is not currently the practice in the department. Marginal agricultural peatlands could be purchased by the government for wetland preservation or management, although this could be expensive. Finally, the act may be used to support research and experimentation which may be of assistance in establishing new farming techniques on peat soils.

Agricultural Service Board Act

This act permits the appointments of Agricultural Fieldmen and District Agriculturists as well as the creation of Agricultural Service Boards. The boards are responsible for providing advice about soil and water conservation programs, and land utilization with respect to improving the economic welfare of the farmer. The act allows the board and its employees to supervise,

rehabilitate, or reclaim land if the land is being changed by wind or water erosion, or if the land productivity has been affected. The implication of this act to wetland management is that local governments may have some influence through the Agricultural Service Boards over how peatlands are farmed.

Alberta Energy

Small Power Research and Development Act

The act was designed to provide incentives and subsidies to small producers of electrical energy to encourage pilot projects in alternative electrical energy sources. The alternative sources were expanded in 1990 to add burning fuel peat to produce electricity, to the existing categories of solar, wind, hydro, geothermal, and biomass energy. The total power allotment available for this program was limited to 125 megawatts.

Possible Implications To Wetland Management: One application to burn fuel peat to produce 30 megawatts of electricity was accepted under this program. The future of the project, proposed for an area near the boundary of the Non-settled Area, is uncertain because of the environmental assessment requirements. Because the power program was fully subscribed as of August 1992, no further incentives for fuel peat extraction exist under this act.

Energy Resources Conservation Act

The act created the Energy Resources Conservation Board (ERCB) which is responsible for reviewing energy developments. The purposes of the review could include: determining the reserves and productive capacity of the resource; determining whether there is sufficient demand; and controlling pollution and ensuring conservation in the exploration, processing, development, and transportation of the energy resources and energy. The board can make binding recommendations about exploration, development, or conservation of energy resources (Section 22). If the board's decision about an application may affect an individual's rights, that person may make representation to the board. A local intervenor may also make representation to the board; a local intervenor is defined as someone who has an interest in or occupies land that may be directly and adversely affected by the application.

Possible Implications for Wetland Management: Under Section 1(c) of this act, the definition of energy resource can be interpreted to include peat, as peat is a natural resource that can be used as a source of energy. Therefore, applications for fuel peat operations are subject to the conditions of the act, and could be reviewed by the board. Furthermore, exploration for and development of traditional energy sources such as oil and gas also have the potential to indirectly impact wetlands. Wetland issues could be addressed at a board hearing by a local intervenor with an affected interest in the area.

Alberta Municipal Affairs

Provincial legislation gives local governments the right to tax properties and to acquire land. Municipal governments have the right to assess taxes on public land in either the Settled or Non-settled Area. Section 13 of the Municipal Taxation Act allows a municipal government to assess taxes on any pipeline or transmission lines. The Municipal and Provincial Properties Valuation Act gives municipalities the right to assess taxes on provincially-owned land, under certain conditions. The Improvement Districts Act allows councils to assess taxes on pipelines and transmission lines as well as processing or transmitting facilities for natural resources, and oil and gas drilling equipment.

Other legislation gives governments the right to acquire public land, which may include wetlands, for various purposes. The Minister of Municipal Affairs may acquire land within a municipality to undertake any policies, programs, or services under the department's administration (Section 18). The Regional Municipal Services Act allows several municipalities to form a Regional Services Commission to provide water and sewage facilities to more than one municipality, and to expropriate or purchase land for these purposes. Section 127 of the Municipal Government Act prevents an elected council from disposing of any park or environmental reserve within its boundaries without the agreement of the electorate, and proceeds from any approved sale become council revenue. Section 86 of the Planning Act states that an interest cannot be registered on a parcel of unsubdivided land less than a quarter section in size. Thus portions of quarter sections of public land could not be purchased or otherwise designated for preservation purposes.

Possible Implication for Wetland Management: Local governments will be interested in wetland management issues, which may have the potential to affect their tax base or their ability to acquire land for various purposes.

Other Provincial Legislation

Water Resources Commission Act

This act (which may require revision following government reorganization in 1992) established the Water Resources Commission which consists of two Members of the Legislative Assembly, four public members, and assistant deputy ministers from the following departments: Agriculture, Food and Rural Development; Economic Development and Trade; Environmental Protection; Municipal Affairs; and Transportation and Utilities. The functions of the commission are: to "assess and review long-term water resources planning" considering agricultural, economic, community, and environmental factors; to evaluate specific projects which may affect Alberta's water resources; to monitor intergovernmental negotiations pertaining to water issues; and to give advice to the government concerning water resources policy. The commission is permitted to hold public hearings to assist in these functions.

Possible Implications for Wetland Management: Under its mandate to advise government on water policy, the commission has initiated the development of the wetland policy for the Non-settled Area. The mandate of the commission to conduct public consultation gives the public the opportunity to comment on the draft wetland policy.

Northern Alberta Development Council Act

Established by this act in 1980, the Northern Alberta Development Council (NADC) is authorized to "investigate, monitor, evaluate, plan, and promote practical measures to foster and advance general development in northern Alberta" (Section 3), in areas including, but not limited to, social and economic development, and development of services and programs. The council is permitted to hold public meetings as necessary to conduct this work. Much of the land covered by the NADC is in the Non-settled Area.

Possible Implications for Wetland Management: The Council could have a role in the establishment and

evaluation of programs concerning wetlands in the north, in as much as they would affect development.

Natural Resources Conservation Board Act

The Natural Resources Conservation Board is responsible for reviewing certain classes of projects which may impact the natural resources of the province. Natural resources are defined as “subsurface, land surface, fauna and flora resources of Alberta” but energy resources are specifically exempted. The board must determine whether the project is in the public interest, considering social, economic, and environmental impacts. The projects which must be reviewed by the board include forest industry, recreation, mineral, or water management projects, as well as any projects specified in the regulations or as requested by the government (Section 4).

Possible Implications for Wetland Management: The impacts of reviewed projects on wetlands could be considered by the board.

Federal Legislation

As with provincial legislation, no federal legislation pertains uniquely to wetlands. However, three acts that deal with wildlife or water resources may affect wetland management: the Migratory Birds Convention Act, the Canada Wildlife Act, and the Canada Water Act, each of which is summarized below.

Migratory Birds Convention Act

This act ratified the International Convention for the Protection of Migratory Birds of 1916 between Mexico, Canada and the United States. It is administered by Environment Canada. Section 6(a) states “no person shall disturb, destroy or take a nest, egg, nest shelter, eider duck shelter or duck box of a migratory bird.” Similarly, Section 35 of the regulations indicates that no oil or other substances harmful to waterfowl may be deposited in waters used by waterfowl. Potentially these sections could provide some means to prevent wetland filling, and to protect wetlands, including waterfowl habitat on wetland margins; however, they are not widely used.

The Canadian Wildlife Service (CWS) of Environment Canada is responsible for migratory waterfowl popula-

tions under the Migratory Bird Convention Act. As part of their mandate to manage waterfowl, the service has conducted research on habitat loss, economic impacts of waterfowl hunting, and other topics affecting wetlands. The CWS work primarily affects marshes which are generally more productive waterfowl habitat than peatlands.

The CWS and Wildlife Habitat Canada have been collaborating on the “Wetlands are not wastelands” program. Its objective is to develop and assess procedures such as willingness-to-pay, opportunity cost, and cumulative assessment approaches, that will help evaluate wetland resources.

Canada Wildlife Act

The federal Minister of the Environment is empowered under this act to coordinate joint federal-provincial programs, and to acquire, in the name of the federal Crown, lands for research, conservation, and interpretation in respect of migratory birds or other wildlife. Section 2(2) specifies that the provisions of the act concerning wildlife extend to their habitat, recognizing that habitat protection is vital to ensure species protection. This act could empower the federal government to acquire wetlands for wildlife protection or research.

Canada Water Act

The act, administered by Environment Canada, allows the federal government to enter into agreements with provincial governments for the “efficient conservation, development and utilization” of any waters where there is a significant national interest. The act has not been used specifically for wetland conservation, although it has provided authority for joint federal-provincial projects such as the North American Waterfowl Management Plan and the Northern River Basin Study.

Miscellaneous Federal Acts

Acts pertaining to other areas of federal jurisdiction, such as agriculture, fisheries, transportation, or navigable waters may also affect wetland management in Alberta. A number of acts support Canada’s agricultural industry directly or indirectly, including the Department of Agriculture Act, Prairie Farm Rehabilitation Act, Canadian Wheat Board Act, Income Tax Act, Farm Credit Act, the Agricultural and Rural Development

Act, the Agricultural Stabilization Act, the Farm Improvement Loans Act, the Farm Income Protection Act, the Western Grain Transportation Act, and the Excise Tax Act. Generally these acts provide for agricultural incentives, which could potentially result in damage to wetlands through expansion of the agricultural land base onto wetland areas, although their impact in the study area would be limited to peatlands with agricultural potential. The federal Fisheries Act prohibits the deposit of deleterious substances into water used by fish. This would have limited application to peatlands or to slough/marsh wetlands in the Non-settled Area, with the exception of limited locations where fish species use wetlands during their life cycle.

Policies Affecting Wetland Management in Alberta

Wetland Management in the Settled Area of Alberta: An Interim Policy

The Alberta Water Resources Commission coordinated the process to develop a policy for managing wetlands in the Settled Area of the province. The draft policy was revised following public and government consultation. *Wetland Management in the Settled Area of Alberta: An Interim Policy* was given interim approval by Cabinet in 1993. The policy established the overall goal for wetland management in the province as the desire to “sustain social, economic, and environmental benefits that functioning wetlands provide, now and in the future” (Alberta Water Resources Commission 1993). The management objective for slough/marsh wetlands in the Settled Area was to preserve these wetlands where possible, and to mitigate the effects of development where needed.

The policy outlined broad wetland management strategies for specific topics, with an emphasis on Settled Area issues. Management objectives were outlined in areas including wetland ownership, drainage, incentives to landowners for wetland retention, conservation of wetland margins, transportation and utilities planning, water management, wildlife damage, pollution, legislation, consultation, and cooperation and communication. Alberta Environmental Protection was designated as the lead agency to coordinate wetland management among the involved government departments. The policy recommended managing wetlands within the existing

legislative framework. The need to undertake wetlands planning and management on a regional scale was identified, so regional differences in wetland types, distribution, and function could be addressed. A commitment was made to involve private landowners, the general public, and municipal governments in the planning and management of wetlands to ensure that all wetlands, including those located on private land, could be addressed.

The interim policy will be combined with the results of the current policy development on peatlands and Non-settled Area wetlands to develop a comprehensive wetland policy for the province.

Draft Peat Policy

The former department of Forestry, Lands and Wildlife initiated discussion about management of peatlands in the province in 1990. A working group chaired by Public Lands Division solicited comments from a representative range of government, industry, and special interest groups about peat resource management. A preliminary peat resource management discussion paper was then prepared and circulated to departmental directors for comment. The basis of the background paper and draft policy statements was that the provincial government will facilitate development of the peat and related resources found in peatlands and that representative peatland ecosystems should be protected before extensive peat allocation for resource development occurs. Three issues surfaced repeatedly during discussions: the lack of sufficient inventory data to facilitate peat use planning and management; the potential negative effects associated with peatland drainage for any purpose; and the need to conserve the resource. Along with the background paper, proposed peat policy statements were circulated. The draft statements addressed administration, planning, inventory, management, and reclamation issues addressing details such as the length of peat leases, royalties to be charged, and the amount of money which should be posted as a performance bond to ensure site reclamation. It is expected that this peat policy, which addresses specific details of allocation of peat resources, will function within the framework of a comprehensive wetland policy.

Forest Conservation Strategy

The former department of Forestry, Lands and Wildlife made a commitment to prepare a forest conservation strategy to guide forest management practices. The strategy was to be part of an overall natural resources policy for the department, which was expected to evolve from strategic planning occurring in the department in 1992. The forest conservation strategy was expected to establish which values would be associated with the forest resources. The process to develop a forest conservation strategy was initiated in 1993. Such a strategy could affect forested peatlands as well as wetlands located next to timber harvest areas.

Forest Management Policy

In 1991 the former Forestry, Lands and Wildlife department prepared a response to the recommendations of the Report of the Expert Review Panel on Forestry titled *Forest Management in Alberta*. Departmental positions were presented about four issues including reforestation, wetland area harvesting, drainage, and operating ground rules which may have an impact on wetland management in the Non-settled Area.

First, the department indicated that information will be collected during stocking surveys on wet sites to provide a data base to assess reforestation success. Second, summer harvesting on wetland areas will not be permitted until such time as technology exists so that harvesting will not damage the environment; until then, only winter harvesting will be allowed. Reforestation implications on wetlands will be considered when providing conditional approval for harvesting. This suggests that harvesting may be limited where reforestation may not be successful, given the statement that "if industry is going to harvest, the growing stock must be replaced" (Forestry, Lands and Wildlife 1991: A33) and an "area for which reforestation cannot confidently be assured ought not to be harvested" (Forestry, Lands and Wildlife 1991: A16).

Third, the panel expressed concern about the potential for widespread peatland drainage for site improvement to increase timber yield. They identified the value of the forest, including peatlands, in mitigating effects of climatic change by acting as carbon sinks. The department agreed that the impact of forest drainage on carbon balance and climate change would have to be addressed

before large-scale drainage was considered. The department agreed that further research into the ecological, environmental, and economic values of drainage would be required before drainage would be permitted and identified Forestry Canada as the appropriate institution for research on impacts of global warming on forests and reforestation. Currently forest drainage research in Alberta is being conducted by Forestry Canada, although it is limited primarily to measuring tree growth response and evaluating the changes in vegetative ground cover. The department indicated that no commercial drainage operations were currently in place, and stated that drainage is not expected to be an issue of concern in the short term.

Finally, the panel also recommended that ground rules for road development and stream crossing, as well as logging technology for wetland areas, should be reviewed to ensure they are adequate. The department stated that such considerations were already built into the annual operating plans and ground rule review process.

Federal Wetland Conservation Policy

The Federal Policy on Wetland Conservation (1991) represented the culmination of 5 years of policy development involving provincial and federal government departments, various non-governmental organizations (NGOs), and the general public. It reflected the attitudes of Canadians toward conserving wetlands in the country, in the face of continuing wetland loss. Wetlands are identified "as one of the key life support systems on this planet, in concert with agricultural lands and forests." (Canada 1991: 3). The socio-economic and ecological functions performed by wetlands can include: water recharge; natural shoreline protection; natural flood reduction and control; provision of wildlife habitats; biodiversity preservation; and control over chemical cycling, including oxygen and carbon. Wetlands can be a source of forest products or peat for fuel or horticultural use. They can be used for tourism and recreation, scientific research, or subsistence hunting, trapping, and fishing. They can also be natural heritage sites. The degradation and loss of wetlands, particularly adjacent to urban communities, in coastal marshes, and in the central prairies, as well as the value of wetland functions (valued in the billions of dollars) was presented as justification for developing the policy (Canada 1991).

The objective of the federal policy is to “promote the conservation of Canada’s wetlands to sustain their ecological and socio-economic functions, now and in the future” (Canada 1991: 7). The federal government, together with the provinces and territories and the Canadian public will endeavour to reach 7 specific goals:

- maintenance of wetland functions and values in Canada;
- no net loss of wetland functions on all federal lands and waters;
- enhancement and rehabilitation where wetland loss has reached critical or threshold levels;
- recognition of wetland functions in resource planning and economic decision-making conducted by the federal government;
- securement of nationally significant wetlands;
- recognition of sustainable practices in forestry and agriculture that consider wetlands; and,
- utilization of wetlands considering future generations.

Strategies outlined to achieve the stated goals include:

- developing public awareness;
- managing wetlands on federal lands and waters;
- promoting wetland conservation in federal protected areas such as national parks;
- enhancing cooperation with the provinces and non-government organizations;
- conserving wetlands of significance to Canadians;
- ensuring a sound scientific basis for policy; and
- promoting international actions consistent with the policy.

The federal policy applies directly to federal lands (which are not included in this study) and to areas where federal programs or spending may affect provincial wetlands. It applies indirectly to provincial wetland management by making provisions for federal government funding for education and research which may benefit the province. It also provides a basis for cooperation between federal and provincial governments as well as non-government organizations in wetland management to support joint efforts for wetland conservation.

Federal Policy on Land Use, National Agricultural Strategy, Federal Water Policy, Green Plan

Some federal policies indirectly affect wetland management. The Federal Policy on Land Use (1984) emphasized that rights of private landowners are to be preserved, and the National Agricultural Strategy (1986) stressed the importance of coordinating soil and water conservation programs to protect the agricultural resource.

The importance of wetlands had been identified more directly in land use and water policy statements prior to the comprehensive wetland policy adopted in 1992. The Federal Water Policy (1987) stated the need to conserve and enhance the nation’s wetlands through such actions as minimizing impacts of activities, promoting public awareness, conducting research, and conserving wetlands on federal land. This policy laid the groundwork for the federal wetland conservation policy. The Green Plan (1990) described plans for a healthy environment for Canadians and made reference to the importance of the wetland ecosystem. The Green Plan committed the government to adopting the national wetland policy in 1991. Under the plan, funding has been provided for wetland preservation work in Ontario and British Columbia.

The federal policies do not directly affect wetlands in the study area. However, these policies set the tone for wetland management and identified several important components to be incorporated. Private rights must be respected in establishing wetland management policies and programs. The coordination required between federal soil and water management programs will ensure that agricultural policies affecting peatlands must consider impacts on water resources. Furthermore, these policies encouraged the federal government to adopt the wetland conservation policy, which will directly affect federal lands, and could indirectly affect some provincial wetlands. They also provided the rationale for education and research funding which may benefit the province.

National Forest Strategy, Canadian Forest Accord

The Canadian Council of Forest Ministers and representatives of forest and wildlife organizations signed the

Canadian Forest Accord in 1992. It is a statement of agreement among Canadians on the future of forests in the country. The goal of the accord is “to maintain and enhance the long-term health of our forest ecosystems, for the benefit of all living things, both nationally and globally.” This is to be accomplished while providing environmental, economic, social, and cultural opportunities for the benefit of present and future generations.

The background material for the accord states that more than 40 percent of Canadian forest land consists of non-continuous cover forests, which include “muskeg” or peatland. Therefore several aspects of the accord may have an impact on wetland management in Alberta. The commitment to better and more extensive inventory information should provide additional information about wetland extent and vegetation cover. The commitment to a broader range of forest uses may encourage non-timber-related uses particularly on wetlands with low commercial timber value. Finally, the decision to review silvicultural techniques in terms of sustainability will encourage evaluation of forest drainage and timber harvest plans in light of their effects on forest productivity.

Wildlife Policy

The goal of the Wildlife Policy for Canada (1990) is “to maintain and enhance the health and diversity of Canada’s wildlife, for its own sake and for the benefit of present and future generations of Canadians.” Some aspects of the policy will apply to wetland management. It is recommended that a wetland policy should “provide for conservation of wildlife and its habitats, and should ensure that all uses of resources are sustainable.” (Environment Canada 1990: 11). To improve wildlife conservation, a system of protected habitats is recommended, which could include wetlands. In addition, wildlife agencies should be consulted in policy development for resources including wetlands.

Programs and Activities

Alberta Environmental Protection

Sub-basin water management planning

Sub-basin water management planning is designed to coordinate water management activities undertaken by Alberta Environmental Protection with the land use

management undertaken by local authorities in northern Alberta. The purpose is to ensure that water issues are considered in municipal development plan preparation. The main areas of concern include water management planning, management of agricultural drainage, erosion control, on-farm water management, and mitigation of wildlife habitat losses. The process provides a coordination and advisory function, and provides a vehicle for integrated planning with a focus on the water resource. Although sub-basin water management planning was designed to address the Settled Area only, it was expanded to include recreational lakes and their contributing watersheds in the Non-settled Area, recognizing the importance lakes play in tourism development in the north.

Alberta Water Management and Erosion Control Program

The objective of the Alberta Water Management and Erosion Control Program is to provide financial and technical assistance to local authorities for the enhancement of water resources and to provide corrective measures where water, in its natural state, creates conditions adverse to the public interest. Cost-sharing agreements exist between the provincial and local governments to fund water management, flood control, drainage and erosion control projects on agricultural lands. This program applies to private lands, and will have only an indirect impact on the study area.

River Basin Planning Program

River basin plans are being conducted on a number of scales in river basins which include some Non-settled Area lands, including the Cold Lake-Beaver River basin and the Winagami-Kimiwan-South Heart basin. Usually basin plans are initiated when interest in an area is generated through perceived water problems or immediate concerns, such as flooding or water supply.

Wetland drainage can impact the volume and timing of stream flows, as well as the quality of water entering a stream. This information directly affects a river basin plan. Changes in sedimentation rates caused by drainage would also affect a river basin plan. Therefore, any wetland uses which may affect water quantity or quality must be considered in the context of a river basin plan.

Integrated Resource Planning

Integrated resource plans (IRPs) present a comprehensive policy framework within which land can be managed and allocated to a variety of uses. The planning process recognizes that management or use of one resource may affect other resources, and therefore, the different resource uses should be planned together. The objective is to facilitate land use decisions that will maximize the benefits derived by the people of Alberta, now and in the future.

The process attempts to balance resource protection, conservation, and development. It incorporates public consultation and encourages discussion between different resource users. IRPs are coordinated with local municipal plans, regional land use plans prepared by regional planning commissions, water resources plans, and parks plans. IRPs are conducted at 3 levels: regional, sub-regional, and local, moving from the discussion of general resource allocation and planning priorities to the specific management decisions.

Departmental policies, objectives and guidelines provide the provincial context within which IRPs are developed. A policy for managing slough/marsh wetlands in the Non-settled Area and provincial peatlands will provide direction for managing the wetland resource. Any policy components addressing additional resource inventory, evaluation, or research concerning wetlands will benefit the integrated resource planning program by providing additional information that can be used to assess alternative resource allocation proposals.

Ecological Corridor Agreements

An ecological corridor agreement (ECA) is registered as a restrictive covenant on a land title when public land adjacent to a watercourse is sold. It is designed to protect sensitive areas adjacent to streams in a natural state. ECAs are managed by Alberta Environmental Protection. Some activity within the corridor may be permitted, as long as it does not damage the area. The application of ECAs in the Non-settled Area would be limited but it could be applied to the perimeter of a wetland, or along a watercourse related to a wetland, if public land in the Non-settled Area were released for sale.

Wetlands for Tomorrow

This ongoing program, established in 1982, teamed the Fish and Wildlife Division (formerly with Alberta Forestry, Lands and Wildlife) with Ducks Unlimited (Canada) in major planning and construction activities on 20 critical wetlands in Alberta to increase their habitat value and therefore waterfowl productivity. The program objective is to ensure the protection and retention of key wetlands. The 20 key wetlands in Alberta are recognized for their importance in contributing to waterfowl production, as well as staging areas for northern-breeding ducks and geese during spring and fall migrations. Three of these key wetland complexes are located in the Non-settled Area: the Hay-Zama Lakes complex; the Peace-Athabasca Delta; and Utikuma Lake.

Key wetlands are designated as special Habitat Management Areas by Order-in-Council under the Wildlife Act. The area can include the wetland or lake as well as a surrounding buffer zone. Progress on this program has been most successful on Big Hay Lake in the Settled Area. Similar progress has not occurred in the Non-settled Area to date.

Notations

The government maintains a computerized database that records interests various government departments have in particular parcels of land. These interests, or notations as they are called, may be placed on land to ensure the protection, development, or management of public resources. Final authority for placing a reservation lies with Alberta Environmental Protection. Before any activity affecting the land base is allowed, the database is reviewed to determine if there are any restrictions that apply, and to see which departments should be notified to comment on the activity. For example, a notation may indicate that a particular wetland complex is being considered for protection as a natural area. Thus any plans to construct a road through the area should be reviewed by the Natural Areas staff.

Some notations have already been placed on public peatlands in the Settled Area to limit their use for agriculture, due to the organic or poorly-drained soils. Some peatlands cannot be leased or sold for any agricultural use; on some parcels, unimproved grazing or grazing and haying may be allowed. A consultative

notation may be placed on property for a limited time by a company to allow them to conduct investigations before applying for development leases. Such a notation would prevent another company from leasing the land before the investigation was complete.

Special Places 2000 Initiative

The Special Places 2000 initiative developed a rationale and a process for systematically evaluating protected areas in Alberta. Protected areas include areas designated as provincial parks, natural areas, ecological reserves, and recreation areas. The premise of the initiative is that to achieve sustainable development, conservation must be incorporated into management, and protected areas must be established. Wetlands are identified as one of the five categories of natural history themes which require representation. This initiative could be used to protect certain wetland areas.

Land Exchange Program

Alberta Environmental Protection may enter into agreements with private landholders to exchange privately-held land for public lands. Usually this program is used to return environmentally-significant lands to public ownership while allowing the private landholder to consolidate different properties.

Miscellaneous Wildlife Programs

Three programs related to wildlife and habitat preservation will have a minor impact on wetland preservation. The purpose of the Watchable Wildlife Program is to facilitate wildlife viewing opportunities by developing a network of viewing sites across the province. Generally Watchable Wildlife sites are located on public lands with good public access, often within existing protected areas such as provincial parks. Wetlands often provide good wildlife viewing opportunities. The Landowner Habitat Program is designed to foster cooperation between private landowners and the provincial government to secure essential habitat on private lands. The Buck for Wildlife program is funded by hunting and fishing licence fees, and is designed to help retain, improve, and develop fish and wildlife habitat throughout the province.

Alberta Agriculture, Food and Rural Development

Range Development Guidelines

Suitable public lands, including some peatlands in both the Settled and Non-settled Areas may be available for development as ranges for grazing cattle. Alberta Agriculture, Food and Rural Development is responsible for day-to-day management of agricultural dispositions as of 1992. Alberta Environmental Protection is responsible for evaluating the agricultural suitability of public peatlands based on clearing costs, accessibility, drainage potential, type of peat, and ability to support range use. Certain peatland types, including sedge fens with existing drainage ditches nearby and shallow peat accumulations, may be more suitable for range development and would be given preference over less suitable sites such as acidic, sphagnum-dominated peatlands with deeper peat accumulations.

Under the Rental Credit Program on Grazing Leases, an individual may clear a grazing lease and receive a credit to apply to the land rental charges. For a peatland to qualify under this program, adequate drainage, from an existing road construction or drainage facility, would have to be in place before clearing would be allowed. Therefore, the program does not encourage clearing of grazing leases which have not already been impacted by drainage.

Local Government Programs

Local authorities, including municipal districts (MDs) and improvement districts (IDs), are responsible for providing services in their districts. Improvement Districts are provincially-administered units that cover 65 percent of the province's landbase, most of which is located in the Non-settled Area. The responsibility for public land use activities and planning in IDs remains with Alberta Environmental Protection. However, IDs will have an impact on wetland management through their responsibility for municipal planning and for provision of infrastructure including transportation facilities. Rural municipalities will be able to derive tax revenue from the Non-settled Area, giving them an interest in activities there.

Several regional planning commissions are conducting studies of environmentally significant areas within

regions which include parts of the Non-settled Area. One such study was completed for the Eastern Boreal Forest, an area which includes the Alberta-Pacific forest management agreement area. These studies provide valuable information about environmentally significant wetlands in terms of their own value, as well as the constraints they may pose to various development alternatives.

Local governments may also establish environmental reserve areas (ERAs) around lakes as part of the subdivision approval process. This designation allows the municipality to protect sensitive shorelines, which may include wetlands, from development pressures. The ERA remains municipal property.

International, Federal and Joint Federal/Provincial Programs

Ramsar Convention

The federal government signed the Convention on Wetlands of International Importance (Especially as Waterfowl Habitat) in Ramsar, Iran in 1981. Known as the Ramsar convention, it was sponsored by the International Union for the Conservation of Nature (IUCN). As a signatory to the convention, the Government of Canada agreed to promote conservation of critically important wetlands, based on ecological, botanical, zoological, limnological, and hydrological significance (Environment Canada 1991).

The convention does not establish specific management requirements, and it is not supported by legislation for habitat protection. However, countries which sign the agreement indicate a commitment to establishing a national conservation policy which will improve institutional and organizational arrangements, lead to monitoring of wetland status, and which will encourage development of action plans for wetland conservation. The federal wetland conservation policy fulfilled Canada's responsibility in this area.

Two locations in the Non-settled Area have been designated Ramsar sites, emphasizing their international importance: the Peace-Athabasca delta and the Hay-Zama lakes area. The Peace-Athabasca Delta is critical for waterfowl breeding. Hay-Zama is a lake/wetland ecosystem with eutrophic lakes, flood plains, and river deltas covering 50 000 hectares in the northwest corner

of the province. It is an important staging area for geese and ducks. Special management procedures have been implemented in this area with the cooperation of industry and government to minimize the impact of oil and gas exploration and development activities on the migratory birds.

Canada/Alberta Forest Resource Development Agreement (FRDA)

Under this agreement, Forestry Canada is continuing research initiated by the Alberta government in the 1980s to determine whether peatland drainage would be an effective silvicultural technique for commercial forestry in Alberta. Forestry Canada is evaluating the effects of lowered water tables on tree growth, local hydrology, and vegetation in a research project which must span at least a decade to collect meaningful long-term data. Research is ongoing at four sites in the Non-settled Area, including sites near Valleyview, McLennan, Edson, and Fort McMurray.

North American Waterfowl Management Plan

The North American Waterfowl Management Plan (NAWMP) is a strategy for conservation and management of waterfowl in North America. In Alberta, the Fish and Wildlife Division (Alberta Environmental Protection), the Canadian Wildlife Service, Ducks Unlimited Canada, Wildlife Habitat Canada, and Alberta Agriculture, Food and Rural Development are involved in implementing the plan. Funding comes from a number of sources, including the US government. Of the Alberta budget, approximately 10 percent (about \$1 million in 1991) is targeted for wetland protection and enhancement outside the prairie pothole region (Lumbis 1992). Most of this money is currently being spent for habitat protection and creation on private lands in the Grande Prairie-Peace River area. Thus the program currently has limited impact on slough/marsh wetlands in the Non-settled Area of the province.

State of the Environment Reporting

The federal government is conducting annual State of the Environment Reporting. The report provides data useful for wetland management. Topics covered in the 1991 edition include wetland uses and wetland losses that have occurred through activities such as drainage.

Permanent Cover Program

The Prairie Farm Rehabilitation Administration administers the Permanent Cover Program which was started as part of the Canada/Alberta Soil Conservation Initiative (CASCI). (CASCI was replaced in 1993 by the Canada/Alberta Environmentally Sustainable Agriculture Agreement). The Permanent Cover Program is designed to help restore upland nesting habitat in the prairie pothole (slough/marsh) region. Its purpose is "to encourage Alberta landowners to grow perennial vegetation on erodible or marginal land where annual cultivation is causing soil degradation." Farmers are allowed to enrol marginal agricultural land in the program and to receive payment to convert the land to habitat, but they must enter into a contract to keep the land in permanent cover for 10 or 21 years, depending on the subsidy level chosen. This program is expected to have a limited impact in the study area.

Canada/Alberta Waterfowl Crop Damage Compensation Program and Prevention Program

These programs are administered by the Alberta Hail and Crop Insurance Corporation, and the Fish and Wildlife Division of Alberta Environmental Protection, respectively. The programs are designed to compensate landowners for a proportion of any crop loss sustained from wildlife (such as waterfowl feeding in fields), and to take measures to reduce crop loss through use of devices such as scarecrows. These programs will have limited impact on peatlands in the Settled Area.

Net Income Stabilization Account (NISA) and Gross Revenue Insurance Plan (GRIP)

Programs established under the Farm Income Protection Act (1991) may negatively impact wetlands, as they encourage expansion of cropping onto marginal land to increase the possible subsidy base. This will have a limited impact in the study area.

Wetland Related Organizations

North American Wetlands Conservation Council (Canada)

The North American Wetlands Conservation Council (NAWCC) (Canada) has a mandate to facilitate the

implementation of the North American Waterfowl Management Plan and to promote the development of wetland conservation policies and programs in Canada and internationally. In addition, the council has the task of encouraging the implementation of recommendations from the "Sustaining Wetlands Forum" it sponsored in 1990. The purpose of the conference was to show the environmental and economic significance of wetlands, and to start forming partnerships necessary to address and solve wetland problems.

Several recommendations from the conference apply to provincial peatlands or to slough/marsh wetlands in the Non-settled Area of Alberta. For example, it is recommended that the Federal Provincial Committee on Land Use coordinate wetland research and reporting, and that the impacts of provincial agricultural programs on wetlands be evaluated. Another recommendation is that business groups should prepare codes of conduct with respect to wetlands, similar to those prepared by the Canadian Pulp and Paper Association and the Canadian Sphagnum Peat Moss Association. Furthermore, it recommends that wetland conservation be coordinated at a provincial level to fit within a nationally developed system plan for wetland conservation, with the goals of maintaining or enhancing biodiversity and wetland functions.

Canadian Wetlands Conservation Task Force

The Canadian Wetlands Conservation Task Force (CWCTF) was formed as part of the North American Wetlands Conservation Council following the 1990 Sustaining Wetlands Forum. Its role is to work on implementing wetland conservation policies and programs from a national perspective, and to assist in developing partnerships to achieve these goals. The Task Force has been responsible, along with its financial contributors, for publication of documents on wetlands including *Wetland Evaluation Guide* (Bond et al. 1992), *No Net Loss: Implementing "No Net Loss" Goals to Conserve Wetlands in Canada* (Lynch-Stewart 1992), *Canadian Peat Harvesting and the Environment* (Keys 1992), and *You Can't Give It Away: Tax Aspects of Ecologically Sensitive Lands* (Denhez 1992).

National Wetlands Working Group (Environment Canada)

The National Wetlands Working Group was a subcommittee of the Canada Committee on Ecological Land Classification. The group published a summary of wetland information titled *Wetlands of Canada* (1988) which presented a standardized national system for wetland classification, as well as an overview of Canadian wetlands, and detailed regional information about wetland classification, ecology, functions, values, and pressures. The wetland definitions and general information about Canadian wetlands used in this background report were drawn from that text. The National Wetlands Working Group is planning a national workshop on cumulative environmental impacts on forested and agricultural wetlands for 1993.

Ducks Unlimited

Ducks Unlimited (Canada) (DU) is a private, non-profit conservation corporation. Active in Alberta since 1938, its focus is on the protection and enhancement of waterfowl habitat, including upland habitat adjacent to the wetland. In Alberta DU's work has been primarily in the Settled Area. However, DU is involved in a number of wetland management areas that affect the Non-settled Area, including resource evaluation, resource monitoring, wetland and upland protection, and research and education.

Resource evaluation activities have included the accumulation of waterfowl data that may be useful in evaluating specific wetland functions and values. The organization conducted waterfowl surveys between 1989 and 1991 in the boreal wetlands in the Non-settled Area. Furthermore, DU has evaluated some wetlands as part of the Integrated Resource Planning process conducted by Alberta Forestry, Lands and Wildlife (Lumbis 1992). Wetland protection activities included recommending appropriate buffer areas and land use restrictions to protect the most valuable wetlands identified during the research.

The organization has also conducted surveys to determine critical wetlands that might be subject to development pressures. It has obtained Licences of Occupation to prevent development by identifying an interest in the wetland by installing nesting rafts. DU maintains a list of key staging wetlands on public lands in the Non-

settled Area that would qualify for funding under the North American Waterfowl Management Plan if they were to come under development pressure.

Wildlife Habitat Canada, Nature Conservancy of Canada

Wildlife Habitat Canada was created by the federal government in 1985 and receives funding from the Wildlife Habitat Stamps which are purchased by hunters and the general public. The organization's objective is conservation, restoration and enhancement of wildlife habitat in Canada. Sometimes these objectives are achieved through acquisition of land for habitat protection. The mission of the Nature Conservancy of Canada, a private non-profit organization, is to preserve biological diversity for the future, through the purchase and protection of ecologically significant natural areas, and places of special beauty and education interest. These organizations will have limited effectiveness in the Non-settled area of Alberta where the land is predominantly public land.

Canadian Sphagnum Peat Moss Association

The Canadian Sphagnum Peat Moss Association is an industry group representing 17 national peat moss harvesting companies, including the major companies working in Alberta. The association has developed a policy on peatland development and reclamation to guide its members, and is currently developing guidelines to assist the membership in wetland conservation and mitigation during horticultural peat harvesting. The association also provides planning advice, revegetation and reclamation guidelines, communication between different companies and the government, and financial assistance for research.

Canadian Pulp and Paper Association

The Canadian Pulp and Paper Association has published a statement of their vision for the industry, and the guiding principles for forest land management in Canada (1992). The association "supports the goal of maintaining and enhancing the health and diversity of Canada's wildlife, . . . [including] conservation of biodiversity, ecological processes, and wildlife habitat." (Canadian Pulp and Paper Association 1992). The association recognizes that some forested wetlands are

managed and harvested by the forest industry. The association indicates that “wetlands will be taken into account through the process of integrated forest management . . .” but that additional coordination between government, industry, and conservation groups is necessary to conserve and manage wetlands. The industry will use planning and integrated resource management to sustain wetlands, and is supportive of regulations and guidelines for wetland conservation that are based on sound science.

Northwest Peat and Crop Development Association

The Northwest Peat and Crop Development Association is responsible for compiling and conducting research, and for providing information to farmers about appropriate farming techniques and crops for peat soils. The association focuses on making the best use of peatlands which are already in cultivation or adjacent to cultivated areas and strongly recommends against developing new peatlands for farming. Research on deep ploughing of peat soils has been conducted near Barrhead, where the shallow surface peat was ploughed into the underlying mineral soil in 1992 and carrots were planted. Initial results indicate that the value of specialty crops such as carrots may be much higher than the value of grain produced on the same land, although harvesting and processing arrangements are less established than for grain. In the Barrhead area in 1992, for example, the experimental carrot crop may net \$3000 per acre, while grain may net less than \$100/acre (Macaulay 1992).

This organization has received funding from the Agricultural Initiatives Program, and it is expected to become a producer-owned cooperative in the future. It is an importance source of education and research for farmers dealing with peat soils.

Environment Council of Alberta

As part of the Alberta Conservation Strategy Project, *Alberta's Wetland: Water in the Bank!* (1990) was prepared as a discussion paper to further the goal of achieving sustainable uses of wetlands. The paper outlined the importance of Alberta wetlands, describing their nature, location, benefits, and pressures contributing to wetland losses. Obstacles to sustainable wetland use were identified as: insufficient information about wetland functions; unquantified wetland values; and

legislation with conflicting mandates. Recommendations included: implementing an inventory and ranking system for Alberta wetland; identifying a lead agency responsible for wetland management; instituting a public awareness program; and developing a wetland policy and enabling legislation, based on resource sector and public input.

Wetland Legislation, Policies and Programs Outside Alberta

Ontario Policy for Wetlands

The goal of the Ontario government's policy for wetlands is “to ensure that wetlands are identified and adequately protected through the land use planning process” and it addresses wetlands in Ontario in areas which are subject to the Planning Act (Ontario 1992). To meet this goal, the policy requires “no loss of wetland function or area” of provincially significant wetlands in southern Ontario, where the development pressure is highest. In northern Ontario, the objective is to ensure no loss of wetland functions of provincially significant wetlands. Therefore, some wetland areas in the north could be used in a consumptive manner, as long as important wetland functions were not compromised. In addition to the no-loss policy, the wise use of all other wetlands in the province is encouraged. The policy also limits activities in a buffer zone of adjacent upland habitat to ensure the wetland is not affected.

The policy is based on the prior inventory and classification of provincial wetlands. Currently only the wetlands in the southern part of the province have been classified. The classification process rates a wetland according to its provincial significance, and is designed to provide a measure of existing overall wetland value. It does not take into account potential future uses, or possible pressures on the wetland. The evaluation system classified wetlands based on total hydrological, social, biological, and special features values. Class 1 wetlands have the highest values and Class 7 wetlands have the lowest value. A different wetland classification system is required for the predominantly boreal or peatland wetlands in the northern part of the province.

The Ontario policy was issued jointly by the Minister of Municipal Affairs and the Minister of Natural Resources. It is a positive step in coordinating wetland

management objectives among several departments that have an interest in wetlands. Review of the boreal wetlands was initiated in 1992, and the results will be relevant to the work on the Non-settled Area wetland policy in Alberta. In general, the Ontario approach of creating a wetland inventory and restricting development around wetlands of certain classes provides an example of one approach to wetland management to be considered in the Alberta context.

Manitoba Land and Water Conservation Strategy

Several objectives and policies in Manitoba's *Land and Water Conservation Strategy* (1989) pertain to wetland management. The water conservation objective is "to conserve and manage the lakes, rivers and wetlands of Manitoba so that they can continue to provide economic, aesthetic, and environmental benefits to existing and future generations." Policies to achieve this objective include the use of incentives for wetland retention and the application of appropriate land use practices. The drainage objective is "to enhance the economic stability of Manitoba's agricultural community," taking into consideration environmental as well as economic impacts of drainage, both on the farm, and in the surrounding community. This indicates that plans to drain wetlands for agricultural uses should consider the impacts on other wetland values. One policy to promote appropriate land use recommends converting "fragile lands to alternate uses that reduce degradation and provide public benefits" (Manitoba 1989). Potentially this could be used to restore some wetlands drained for marginal agricultural uses. Manitoba has significant peat resources which support both horticultural peat harvesting and some agriculture. The policy does not specify peatlands, but it is expected to apply to them.

Saskatchewan Wetland Conservation Corporation

The Saskatchewan Wetland Conservation Corporation was established in 1990 to coordinate wetland management in the province (Phillips 1992). The corporation worked with other provincial departments and the Saskatchewan Water Corporation to develop a draft wetland policy for the agricultural area of the province which was released in 1992. The greatest perceived threat to wetland conservation is in the agricultural area,

which is also the area where existing government programs and policies may be having the most significant impact on wetlands. The corporation provides policy direction concerning soil, water, and wetland conservation policies to various government departments, and coordinates the implementation of the North American Waterfowl Management Plan in Saskatchewan.

Quebec Conservation Program

The Quebec government is involved in a flora conservation program, under which some wetlands will be designated as protected areas as habitats for rare or endangered plants. Quebec does not have a program specifically designed to protect wetland ecosystems.

Minnesota Peatland Management

In the United States, only Minnesota has a significant peatland resource. Peat mining, as it is called in Minnesota, is controlled by regulations under Minnesota statutes, administered by the Department of Natural Resources. The purposes of the regulations are:

to control possible adverse environmental effects of peat mining, to preserve the natural resources . . . to encourage the planning of future land utilization, while . . . promoting the orderly development of peat mining, the encouragement of good peat mining practices, and the recognition and identification of the beneficial aspects of peat mining (Minnesota 1985).

The regulations do not address activities other than peat harvesting that may have an impact on peatlands.

Finland Peatland Drainage

Most of Finland's forested peatlands have been drained to increase timber yields for the forestry industry. Recently Finland announced that it would ban any further grants to assist in the costs of draining additional peatlands for forestry (Kennedy 1992).

North Dakota Wetland Policy

North Dakota's wetland policy and legislation passed in 1987 requires that for each acre of wetland disturbed or destroyed by development, another acre of wetland must be created elsewhere (Tkachuk 1992).

New Jersey Wetlands Protection Act

The Freshwater Wetlands Protection Act requires that any activities which may disturb wetlands must be covered by a permit from the state government. The responsibility lies with the developer to show that there are no practical alternatives to the development which could be undertaken without damage to wetlands (Tkachuk 1992).

Oregon Wetland Conservation Plans

In Oregon, the government has initiated wetland conservation plans in several locations in the state, with the involvement of the local communities (Nichols 1992). The plans include a detailed inventory of wetland resources, assessment of values associated with the particular wetland, and procedures to mitigate or compensate for wetland impacts caused by development. Once a plan is in place, any development may occur outside designated conservation areas without further consultation or permitting procedures, as long as the appropriate mitigation or compensation activities are conducted.

Summary

A simple unified approach to wetland management will not likely be feasible, because wetland management covers many topics, including land, water, and wildlife management and conservation, as well as industrial development. In Alberta, no one department or agency is specifically responsible for wetland management in the Non-settled Area of the province. However, Alberta Environmental Protection will play the lead role in wetland management, given its mandates concerning water, land, and wildlife management. Other departments such as Agriculture, Food and Rural Development, Energy, or Municipal Affairs will have an indirect interest in wetland management, where it affects their mandates.

Clearly some of the programs affecting wetland management contradict each other. The most common conflict for peatlands located in the Settled Area is between the goals of agricultural programs seeking to increase productivity which may be accomplished at the expense of the goal of preserving wetlands. Similarly, programs promoting the use of peat as fuel may inter-

fere with water management plans. Therefore, a need exists to coordinate activities affecting wetland management.

The review of wetland activities in other jurisdictions reveals that different jurisdictions have adopted different methods for wetland management. Approaches include policy statements, legislation about wetland planning, removal of incentives for drainage, and regulations for specific land uses such as peat mining. Each approach partly reflects that jurisdiction's perspective on the resource. For example, Minnesota is concerned primarily with a single use of the resource, that of peat harvesting, and has addressed specific regulations to the industry. The Finnish resource has been extensively developed, leading to a prohibition of further drainage subsidies. Development affecting wetlands in Ontario's north has not been extensive, allowing room for some future development, as long as critical functions are not lost.

Review of other jurisdictions also indicated that most have paid little attention to peatlands. Ontario is the first province to undertake comprehensive wetland policy which will include the peatlands found in the northern part of the province. Some approaches designed for areas encompassing primarily slough/marsh ecosystems will not apply to Alberta's Non-settled Area. Legislation or policy which requires mitigation or replacement of wetlands affected by development can not be transferred to peatlands because of the length of time it takes for peatlands to form.

Wetland management in the study area is complicated somewhat by the different approaches which must be taken to address wetland issues on private versus public land. This is further complicated by the division of responsibility for managing public lands between Alberta Environmental Protection and Alberta Agriculture, Food, and Rural Development, although ongoing government reorganization may simplify this matter. Finally, management is complicated because wetlands may be affected by activities directly related to wetlands as well as activities not specific to wetlands such as oil and gas development.

Chapter 7: Policy Recommendations

Draft policy recommendations are presented here for discussion purposes. The recommendations build on the information contained in the previous chapters of this background report: wetland distribution (Chapter 2); functions and values (Chapter 3); principles of wetland management (Chapter 4); and the factors affecting wetland management (Chapters 5, 6). The report concentrates on peatlands located throughout the province and slough/marsh wetlands in the Non-settled Area.

In this chapter, the characteristics of the wetland resource that will influence appropriate policy options are summarized, along with the concerns and issues of wetland management in the focus area. The principles that should guide wetland policy development are summarized from Chapter 4. This information provides the context in which the draft policy recommendations were prepared for public discussion.

The recommended provincial policy goal for wetland management is presented, along with statements of management intent for peatlands, slough/marsh wetlands, swamps and shallow open water wetlands, and regional application. Strategies for implementing the policy are outlined.

Factors Influencing Policy Options

Several factors will influence which policy options are appropriate for wetland management in the Non-settled Area of Alberta and for peatlands located throughout the province. First, most of these wetland resources are publicly owned, and are managed by the government for the benefit of all Albertans. Second, wetlands are not isolated features on the landscape; they cover extensive areas and may comprise almost 100 percent of the landscape in some regions of northern Alberta. Most wetlands are found in complexes that may consist of several different wetland types and may cover thousands of hectares. Third, peatlands (bogs and fens) are the most common wetland types in the Non-settled Area. Fourth, the information base about peatlands and slough/marsh wetlands in the Non-settled Area is limited, and many functions and roles of Non-settled Area wetlands and peatlands are not well understood. Finally, development pressures on the wetland resource in the focus area are relatively recent.

Wetland Concerns and Issues in Alberta

Various activities are currently having an impact on wetlands in Alberta. Several other activities have the potential to impact Alberta wetlands in the future. The following issues and concerns were identified by government agencies and other groups contacted during the preparation of this report; some issues were identified by participants in the public review of the Interim Policy for Wetlands in the Settled Area.

1. No policy is currently in place to guide resource management decisions concerning provincial peatlands or slough/marsh wetlands in the Non-settled Area. As most of the land is publicly owned, management strategies that focus on provincial government activities and responsibilities are required.
2. The demand for horticultural peat deposits is reaching the limit of available supply in the Settled Area. Searches for new peat deposits are taking companies into the Non-settled Area. In addition, preliminary interest has been expressed in the use of peat as an energy source and the use of peat for industrial absorbents. Currently the government does not have sufficient information about the province's peat resources to fully evaluate the suitability of proposed sites for various uses.
3. Increasing activity in the Non-settled Area, including oil and gas development, and road and utility construction, may be affecting the wetland resources to an extent that has not been evaluated and in ways that are not fully understood.
4. Some peatlands located on private land in the Settled Area have been converted to agricultural use through techniques such as drainage, vegetation clearing, and soil treatments including deep plowing or removal of all peat. In some areas, removed peat soils have been burned. These activities may have significant impacts on the hydrology in the watershed, and will result in habitat loss. Because the land is privately owned, the government does not have direct controls over peatland conversion to agricultural use.

5. Timber harvesting is occurring across Alberta's Non-settled Area. This area is covered extensively by peatlands, some of which may be suitable for timber harvest. The potential for successful reforestation on peatlands is not known. The impacts of forestry activity on wetland hydrology are not well understood. Harvesting may be creating a need for drainage to enhance reforestation on wet areas; the impacts of this on the hydrology of an area have not been determined.
 6. Peatland drainage has been used in other countries such as Finland to improve timber yields on wet soils. This procedure is being used experimentally in Alberta to determine its suitability to our climate, peatlands, and forestry practices. No commercial forestry drainage operations are currently underway. However, some estimates indicate that over 4 million hectares of Alberta peatlands might be physically suitable for peatland drainage. The impacts of drainage on Alberta's peatlands and water quality and quantity have not been fully evaluated, although some research is ongoing.
 7. In the past, some land designated as "non-settled" or "green" area has been converted to "settled" or "white" area. When this happens, the land ownership changes to leasehold or private ownership and land use changes to agricultural uses, including cattle grazing or cropping. Future conversions are possible, and could be accelerated if there were an increased demand for agricultural land or changes in the land suitability created by factors such as climate warming. Once land is converted to private ownership and agricultural uses, the government loses some flexibility in managing wetland resources on the transferred land.
 8. The possible expansion of oil sands mining in the Fort McMurray area has the potential to disturb large areas of wetlands. The timing of such expansion will be affected by many factors, including world oil prices and available technology, and is difficult to predict.
 9. Communities are looking to tourism and outdoor recreation for economic development. Wetlands could be affected in two ways. First, they provide some of the natural attractions desired by tourists. Second, wetlands may be affected by the development of tourism infrastructure. For example, a marina development on a lake may destroy some marsh habitat along the lake margin.
- ## Principles
- Several principles that guided wetland policy development were discussed in Chapter 4, and are summarized here.
- Wetlands should be managed as ecosystems. They are an important and integral part of our environment.
 - Wetland policy and management should recognize the variability in wetland type, size, distribution, functions, and significance, in different regions of the province.
 - Different types of wetlands have different social, economic, and environmental functions and values. This variety of values should be reflected in our decision-making processes.
 - Wetland management involves and affects many Albertans. Public involvement in policy development and resource management is essential and should be supported by adequate public information.
 - Government departments and agencies at local, provincial, federal, and international levels should cooperate in wetland management.
 - Wetlands should be managed using the best available information, as it is obtained, recognizing the uncertainty inherent in the information. Ongoing research to improve our understanding of wetland functions and values is necessary.
 - Options for future generations should be retained as much as possible. This is especially important for peatlands because they may take hundreds or thousands of years to form.

Policy Goal

Wetland management in Alberta should be guided by a clear policy goal. The recommended policy goal states:

The goal of the Government of Alberta is to sustain the social, economic and environmental benefits that functioning wetlands provide, now and in the future.

This goal provides direction for wetland management, including peatlands, slough/marsh wetlands, swamps, and shallow open water wetlands. Incorporated in the goal statement is the recognition that wetlands provide diverse benefits, and that all these benefits must be considered in any management decision.

Policy Intent

Peatlands: The intent of the policy with respect to **peatlands** located throughout the province is:

- to ensure that representative, rare, and unique peatland ecosystems are set aside to protect identified values;
- to allow use of peatlands where the social and economic benefits of development are considered to be greater than the loss of wetland functions and values; and,
- to minimize, and mitigate where necessary, the adverse effects of developments in the watershed which impact peatlands, as well as the effects of peatland developments on the watershed.

Peatlands are relatively abundant in Alberta, especially in the Non-settled Area, and extensive peatland development has not occurred in the province to date. Therefore the opportunity still exists for some peatlands to be set aside now to meet specific goals, such as preserving a unique peatland. This is particularly important because peatlands take thousands of years to form, and cannot be recreated or fully restored if they are disturbed. However, the extensive nature of peatlands means there is also room for some development to occur to meet social and economic objectives, as long as development impacts are minimized.

Slough/Marsh Wetland: The intent of the policy with respect to **slough/marsh wetlands** located throughout the province is:

- to conserve slough/marsh wetlands in a natural state;
- to mitigate degradation or loss of slough/marsh wetlands benefits as near to the site of disturbance as possible; and,
- to enhance, restore, or create wetlands in areas where slough/marsh wetlands have been depleted or degraded.

These statements for slough/marsh wetlands were developed as part of the Settled Area process, and are stated in descending order of preference. They would also apply to the Non-settled Area because slough/marsh wetlands perform similar functions, such as providing waterfowl habitat, regardless of their location in the province. The emphasis on conservation reflects the historical loss of this type of wetland in the province, although the loss has occurred primarily in the Settled Area. Wetland enhancement or restoration is feasible with slough/marsh wetlands, and has been the subject of extensive research.

Shallow Open Water, Swamps: The intent of the policy with respect to wetlands classified as **shallow open water or swamps** is:

- to recognize the shallow open water or swamp as a component of the adjacent wetland type, whether that be peatland (bogs and fens) or slough/marsh, and to manage them as part of that wetland type.

This will allow complexes of different wetland types to be managed as a single functioning ecosystem.

Regional Application: The intent of the policy with respect to **regional variation** in wetlands is:

- to develop regional wetland management objectives and targets that recognize the regional variation in the distribution of different wetland types, functions, values, and ownership.

Distinct management approaches may be required in different parts of the province.

Management Strategies

Management strategies aimed at achieving the above policy intents are presented here for discussion. In each category a brief description is included, and issues especially affecting Non-settled Area wetlands or

provincial peatlands are identified. Strategy recommendations are presented in italics, and some specific strategies are outlined in the following paragraph. Some of the strategies were drawn from *Wetland Management in the Settled Area: An Interim Policy* (Alberta Water Resources Commission 1993).

Policy Administration

Responsibility for managing wetlands does not rest with a single provincial government agency. The departments of Agriculture, Food, and Rural Development; Environmental Protection; Municipal Affairs; Transportation and Utilities; as well as other departments, have mandates which could affect wetland management. Given this division of responsibilities, it is important to clearly designate an agency responsible for coordinating wetland policy implementation.

Recommendation: Alberta Environmental Protection will be responsible for coordinating wetland management and the implementation of the wetland policy among the existing government departments.

Wetland management activities will include inventory, assessment, monitoring, education, planning, research, implementation and enforcement. A report on the status of these activities and policy implementation will be tabled in the Alberta Legislature every five years.

Planning

Wetlands are ecosystems where complex interactions occur among components of air, water, land, vegetation, and wildlife. These interactions can be affected by activities occurring within the wetland, or on the adjacent land within the watershed. These interactions must be considered in resource planning, management, and decision making. Systematic wetland planning does not occur currently in Alberta, although wetlands are addressed under processes such as water management planning and planning for projects such as forestry development that may impact wetlands. Planning also must address the regional variations that exist in wetland types and demands.

Recommendation: An integrated approach to wetland planning and management will be used. Wetlands will be managed as functional ecosystems, and the impacts on wetlands of activities occurring on surrounding land will be considered. Regional wetland management objectives will be determined as part of wetland planning.

Alberta Environmental Protection will coordinate interdepartmental wetland planning and development of regional wetland management objectives. Regional objectives will guide management activities within the context of this policy. In addition, the wetland policy will be incorporated into existing planning programs such as integrated resource, river basin, transportation and utility, municipal, tourism development, local conservation, and forest use planning.

Inventory

Information about wetlands in the Non-settled Area and provincial peatlands is limited. However, new information continues to be collected by a variety of agencies. Government agencies as well as private sector organizations such as Ducks Unlimited have collected wetland information for different areas of the province for various purposes. Forest companies have also collected vegetation information which indirectly provides information about wetlands. A map showing the distribution of Alberta peatlands was published in 1992 as a result of activities at the University of Alberta.

Recommendation: Alberta Environmental Protection will coordinate the development and maintenance of a provincial information base about wetlands. The information base will be used to facilitate wetland planning and to allow informed wetland management decisions to be made.

Alberta Environmental Protection will coordinate the creation of a provincial information base about wetlands using existing and new sources of data. Key data that could be collected at the broad level are wetland extent, size, abundance, location, distribution, type, ownership, surrounding land use, functions, and values. Inventories could include information about ecological factors such as soils, vegetation, wildlife, hydrology, and climate, as well as social and economic factors such as traditional use, or suitability for peat harvesting.

Coordination and Cooperation

All levels of government, including federal, provincial, and local, have an interest in wetland management in Alberta, and are responsible for programs and policies affecting wetlands. For example, the federal government is responsible for implementing the federal policy on wetland conservation in the national parks. In addition, various non-governmental organizations have important roles to play in wetland management.

Recommendation: Management activities of the different levels of government (federal, provincial, and local), the provincial government departments, non-governmental organizations, and individuals will be coordinated to encourage wetland policy implementation.

Wetlands and wetland values will be considered in all other provincial policies, programs, and activities. Other provincial programs will be modified as necessary to maintain consistency with the wetland policy. Local governments will be involved in wetland management and program implementation, where appropriate.

Conservation and Preservation

Some wetland use for various development activities may occur to meet economic and social goals. Wise use or conservation of the resource is necessary to increase the likelihood of sustained and productive use of that resource. Activities on land adjacent to wetlands may indirectly affect wetlands, and this should be addressed. For example, road construction may alter the near-surface flow patterns of the groundwater, affecting the water balance in an adjacent wetland. Actions occurring away from wetlands, which generate conditions such as acid precipitation or climate warming, may also degrade wetlands. Water quality and the biological processes in wetlands may be impaired if pollution levels from sources such as pipeline leaks or soil erosion are excessive.

In addition to the wise use of some wetlands, representative, rare, and unique wetlands should be afforded some level of protection from development. This will help to maintain certain wetland values, to preserve biodiversity, to secure wetlands of importance to Albertans, and to maintain sufficient areas for uses such as recreation. Protection mechanisms range from minor

limitations on land use to total restriction of activities within an area.

Recommendation: Social, economic, and environmental values derived from wetlands will be considered when making decisions concerning development that may alter the functions or values of a wetland. Activities on public lands that may result in wetland degradation will be controlled through regulations and guidelines on dispositions to prevent or minimize impacts on wetlands. Representative, rare, and unique wetlands will be protected. Development that may impact wetlands will proceed cautiously and with consideration of other possible values.

Representative, rare, and unique wetlands will be secured by protecting a variety of wetland types, using a range of existing protected area designations. Areas that require some measure of protection would be determined through regional planning and existing and proposed protected area programs. A conservative approach to wetland allocation will be maintained to ensure some wetlands remain unallocated and available for future use. This will also permit flexibility in dealing with possible changes to the wetland resources which could result from long-term conditions such as climate change and short-term changes such as drought.

Drainage

Wetland drainage involves the removal of some or all of the water from a wetland to increase its suitability for a variety of uses. A licence is required from Alberta Environmental Protection for any project involving drainage. For peatlands, drainage generally refers to the practice of lowering the groundwater table. For slough/marsh wetlands, drainage may involve removing all surface water from the wetland. Drainage is a standard technique used in horticultural peat harvesting to allow peat moss to be harvested. Drainage has been used experimentally to improve tree growth for timber harvesting in Alberta, and may also be appropriate to improve reforestation success in wet areas. Drainage may increase the agricultural capability of wetlands, including peatlands.

Various environmental impacts are associated with drainage. Drainage will alter the conditions in the wetland, changing such things as the vegetation or

wildlife the wetland supports, or the role of the wetland in the water cycle in the area. Drainage may have downstream impacts on water quality or quantity or timing of flows.

Recommendation: Proposals involving drainage of wetlands will be evaluated comparing all benefits and costs related to draining the wetland to those of leaving it in its natural state. Other projects will be assessed and possibly altered to minimize indirect changes to wetland hydrology.

Decisions concerning drainage will be based on the wetland policy and must be consistent with regional wetland management objectives. Interdepartmental referral of drainage proposals will continue, to ensure consideration of a full range of wetland values.

Water Management

Wetlands serve useful water management functions, such as flood control, water purification, flow regulation, or groundwater recharge, depending on the type and location of the wetland. Wetlands can be used as a tool in water management. They can actually be created or altered to improve their usefulness as a water management tool.

Recommendation: The value of certain wetlands for water management purposes will be recognized in management decisions.

Wetlands will be considered as a possible tool that could be used to achieve water management objectives.

Surrounding Land and Wetland Margins

Activities on land adjacent to wetlands can have significant effects on wetlands. Many benefits of wetlands such as forage, recreational opportunities, and wildlife habitat may be lost if wetland margins are cleared of natural vegetation to the edge of open water.

Recommendation: The roles that the upland area surrounding a wetland and that the wetland margins play in the ecosystem will be considered in wetland management decisions.

The possible effects of surrounding land use on wetlands will be considered when decisions are made. If necessary, upland activities will be limited to protect critical wetland functions.

Transportation, Utility, Energy, and Community Development

Transportation, utility, energy, and community developments, such as roads, pipelines, well-sites, and mines, have contributed directly to the loss or degradation of wetlands where construction occurs on or through wetlands. Indirect impacts are also possible, for example, through the alteration of natural drainage patterns caused by road construction.

Recommendation: The impacts of road, industrial, or community development on wetlands will be evaluated in the decision-making process and minimized.

Retention of wetlands during transportation, utility and energy development as well as community expansion will be encouraged. Mitigation of damage to wetlands and natural drainage patterns may be required to meet regional wetland management objectives.

Wetland Ownership

Wetland ownership is a complicated matter. Ownership of water in all wetlands, including peatlands, is vested in the province under the Water Resources Act. In addition, wetlands located on public land, including all wetlands in the Non-settled Area, belong to the province. The government may grant individuals or companies the rights to certain uses of the land such as grazing, peat harvesting, or timber harvesting, but the land ownership remains with the province. On private land, the bed and shore of wetlands that are “permanent and naturally occurring water bodies” are owned by the government under Section 3 of the Public Lands Act unless the title has been specifically granted to a private landowner.

Recommendation: Management of wetlands on both publicly and privately held lands will be addressed by this policy.

Public land with significant wetlands will not be sold or made available for dispositions that could alter the character of the wetland. Landowner stewardship of wetlands on private land will be encouraged.

Legislation

Wetland resources are covered indirectly by several laws which address development or conservation of various land, water, and wildlife resources. The mandate to manage both land and water resources in the Non-settled Area now rests primarily with Alberta Environmental Protection, although other departments have mandates that have some impact on wetland management.

Recommendation: Existing legislation and mandates will be used to manage wetlands, with modifications as necessary.

The wetland policy will be implemented under existing resource management legislation with modifications where necessary. Existing legislation is generally sufficient to allow these policies to be implemented, so new wetland conservation legislation is not necessary. The resource management mandates of provincial government agencies will be recognized and used.

Research

Wetland research is being conducted in Alberta by government agencies, private industry, and the academic community in an effort to better understand the functions and values associated with wetlands in general, and peatlands in particular. Many questions about peatlands remain. More research will give resource managers a better understanding and will assist them in making informed decisions about wetland management. Initial efforts are being made by the research community to coordinate peatland research.

Recommendation: Wetland research will continue to be conducted to improve the quality of information available to assist decision making. Attempts to coordinate research activities will be supported. Some peatland research areas include peatland restoration, forest hydrology and the impacts of drainage, and the agricultural potential of peatlands.

The government will continue to conduct some research on wetlands while supporting wetland research being conducted by others. A strategic, coordinated approach to wetland research involving the government, the academic community, and industry will be developed. The government will assist in communicating results to

the wetland managers and other groups. Researchers will be encouraged to consider management implications of their research efforts to ensure that the collected information will be of use to resource managers.

Education

Many Albertans are unaware of the extent of wetlands, particularly peatlands, in Alberta. They may not know what peatlands look like, or where they are located. They may not understand the benefits or the costs associated with wetlands, either in their natural state, or under various development scenarios. Existing information should be collected and specific education programs prepared for distinct audiences.

Recommendation: Available information concerning wetlands will be provided to Albertans to assist in their understanding of the functions and values of wetlands and to enable the public to participate effectively in wetland management.

Education about wetlands and their management will be increased and will address groups including resource users, landowners, urban residents, governments and school children. The wetland education efforts of non-government organizations will be encouraged and supported.

Public Consultation

Public consultation is an effective way to determine the public values associated with wetlands, and to determine how to manage the resource to achieve those values. The policy will incorporate public consultation to ensure that the desires of the public are adequately reflected in wetland policy and management decisions.

Recommendation: Public consultation will be an integral part of wetland planning and management, including development of wetland policy and regional objectives.

Albertans will be consulted to determine what values are associated with wetland resources and how they should be managed.

Chapter 8: The Next Steps

The Alberta Water Resources Commission, in cooperation with an interdepartmental steering committee, has prepared this draft policy for the management of all provincial peatlands and for slough/marsh wetlands in the Non-settled Area. The departments represented on the committee included: Agriculture, Food and Rural Development; Environmental Protection; Municipal Affairs; and Transportation and Utilities. The policy statements and management strategies in this document are intended to generate public discussion about how provincial peatlands and slough/marsh wetlands in the Non-settled Area should be managed.

Beyond Prairie Potholes: A Draft Policy for Managing Alberta's Peatlands and Non-settled Area Wetlands is a summary document about wetland management and contains the draft policy statements presented in Chapter 7. The report is available from the Alberta Water Resources Commission. This background report contains the detailed information that was used to generate the draft policy statements and management strategies presented in the summary document.

Several opportunities exist for public review of the draft policy. *Beyond Prairie Potholes*, containing the draft policy, has been widely circulated. A comment form is included with that report. Written or verbal comments on the draft policy would be appreciated. Public meetings will be held in the fall of 1993 and all interested groups and individuals are invited to participate. Comments should be submitted to the Commission no later than November 30, 1993.

Following public consultation, a wetland policy for provincial peatlands and Non-settled Area slough/marsh wetlands will be prepared. This policy will be combined with *Wetland Management in the Settled Area: An Interim Policy* to provide a comprehensive wetland policy for Alberta.

For further information, to place your name on our mailing list, to receive further copies of this draft policy, or to talk about the wetland policy, please contact:

Alberta Water Resources Commission
#910, 10045 – 111 Street
Edmonton, Alberta
T5K 2M5
Telephone: (403) 422-4232 *
Fax: (403) 422-9703

* For toll-free calls from outside Edmonton, please call your local RITE operator (see the blue pages under provincial government) and ask to be connected to this number.

Your input about wetland management in Alberta will be extremely valuable. We thank you in advance for your participation.

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